**Cyclic Aliphatic Bromides Cluster (HBCD)** (CASRN: 25637-99-4; 3194-55-6; 3194-57-8)

Systematic Review Supplemental File for the TSCA Risk Evaluation: Data Quality Evaluation of Ecological Hazard Studies

For references containin information on multiple test organisms, durations, and/or effects in the TSCA Risk Evaluation of Hexabromocyclododecane, multiple data quality evaluation tables are provided *only if* the metrics were evaluated differently. Some papers that underwent evaluation but fell off-topic later on are not summarized in the data evaluation tables. Refer to Appendix F of 'Application of Systematic Review in TSCA Risk Evaluations' at https://www.epa.gov for more information of evaluation procedures and parameters.

 $Table 1: Data \ Evaluation \ table for \ reference \ 938764 \ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/938764).$ 

Study Citation:		on by hexabromocyclododecane (HBCD) and 2,				hormone-mediated Xenopus laevis tadpole tail inated diphenyl ether (BDE206). Chemosphere
Data Type: Hero ID:	Other; Aqu 938764	atic; other tadpole tail tip				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$
Domain 1: Test	Substance					
	Metric 1:	Test Substance Identity	Low	$\times$ 2	6	Hexabromocyclododecane (HBCD technical mixture was used, with no additional information on percentages of various components or if the test substance was further analyzed.
	Metric 2:	Test Substance Source	Medium	× 1	2	Only mentioned the source (BSEF), without any other information about the batch, or product type.
	Metric 3:	Test Substance Purity	Low	× 1	3	purity not supplied by provider
Domain 2: Test	Design					
<b>Domain 2.</b> 1000	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Low	× 1	3	How the tips were allocated to exposure groups was not explained.
Domain 3: Expo	cura Characte	orization				
Domaii 5. Expo	Metric 7:	Experimental System/Test Media Preparation	Medium	$\times$ 2	4	Exposures were statically renewed every other day, and took place in 26-well plates. DMSO was used as the solvent control.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Exposure concentrations were not measured (only nominal amounts provided), however it is likely actual concentrations are similar to nominal concentrations.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Domain 4: Test	Organism					
Domain 4. Test	Metric 13:	Test Organism Characteristics	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
		Continued on next page				

15: 16: ssme 17: 18:	Metric  Metric  Number of Organisms and Replicates per Group Adequacy of Test Conditions  ent  Outcome Assessment Methodology Consistency of Outcome Assessment	Rating <sup>†</sup> High High High High	$\begin{array}{c} \text{MWF*} \\ \times 1 \\ \times 1 \\ \end{array}$ $\begin{array}{c} \times 2 \\ \times 1 \end{array}$	Score  1 1 2	Comments <sup>††</sup> See note '**' at the bottom of the table.  See note '**' at the bottom of the table.  See note '**' at the bottom of the table.
16: ssme 17:	Number of Organisms and Replicates per Group Adequacy of Test Conditions ent Outcome Assessment Methodology	High High	× 1 × 1 × 2	1	See note '**' at the bottom of the table.  See note '**' at the bottom of the table.  See note '**' at the bottom of the table.
16: ssme 17:	Group Adequacy of Test Conditions ent Outcome Assessment Methodology	High High	× 1 × 2		See note '**' at the bottom of the table.  See note '**' at the bottom of the table.
ssme 17:	ent Outcome Assessment Methodology	High	× 2		See note '**' at the bottom of the table.
17:	Outcome Assessment Methodology	~		2	
	0.0	~		2	
18:	Consistency of Outcome Assessment	High	$\times$ 1	1	
				1	See note '**' at the bottom of the table.
Vai	riable Control				
19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
tion	and Analysis				
21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
22:	Reporting of Data	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.
23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
atio	n <sup>‡</sup>	High		1.4	
		Yes			
;	21: 22: 23:	21: Statistical Methods 22: Reporting of Data	21: Statistical Methods High 22: Reporting of Data High 23: Explanation of Unexpected Outcomes High High	221: Statistical Methods High $\times$ 1 222: Reporting of Data High $\times$ 2 23: Explanation of Unexpected Outcomes High $\times$ 1 High	221: Statistical Methods High $\times$ 1 1 222: Reporting of Data High $\times$ 2 2 2 23: Explanation of Unexpected Outcomes High $\times$ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 $<sup>\</sup>star$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} \end{array} \right. \\ \text{(round to the nearest tenth) otherwise} \quad ,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 2:\ Data\ Evaluation\ table\ for\ reference\ 1062065\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1062065).$ 

Study Citation:		B., Tingaud-Sequeira, A., Prats, E., Barata, C., B		,		, <u>.</u>				
D 4 . TT .	vertebrate model for screening chemicals that impair thyroid hormone synthesis. Environmental Science and Technology 45:7525-7532  Acute (0-96 hour); Aquatic; Fish									
Data Type: Hero ID:	1062065	nour); Aquatic; Fish								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
Domain 1: Test S	Substance									
	Metric 1:	Test Substance Identity	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 2:	Test Substance Source	Medium	× 1	2	Source was reported (Sigma), but no other detail on composition (or it's verification specs) or batcl number was reported. The CASRN was included in the SI.				
	Metric 3:	Test Substance Purity	Low	× 1	3	No information provided on test substance purity.				
Domain 2: Test I	)esign									
	Metric 4:	Negative Controls	High	$\times$ 2	2	stock solutions were prepared in DMSO; vehicle control embryos exposed to 0.1 percent DMSO.				
	Metric 5:	Negative Control Response	Unacceptable		4	The biological responses of negative control group were not reported				
	Metric 6:	Randomized Allocation	Low	× 1	3	There was no report on how organisms were allocated to study groups.				
Domain 3: Expos	uro Characte	nrization								
Domaii o. Expos	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Nominal concentrations reported.				
	Metric 10:	Exposure Duration and Frequency	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	Exposures were based on MATCs, as explained in SI, but only one concentration was used. The put pose of the study wasn't to look at a dose responsive resulting from HBCD exposures.				
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.				
Domain 4: Test C	Organism									
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	No report of acclimatization or pre-treatment conditions				
		Continued on next page								

Study Citation:	Thienpont, B., Tingaud-Sequeira, A., Prats, E., Barata, C., Babin, P. J., Raldúa, D 2011. Zebrafish eleutheroembryos provide a suitable vertebrate model for screening chemicals that impair thyroid hormone synthesis. Environmental Science and Technology 45:7525-7532							
Data Type: Hero ID:	Acute (0-96 1062065	hour); Aquatic; Fish						
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$\mathrm{Comments}^{\dagger\dagger}$		
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	A minimum of eighteen eleutheroembryos were exposed. Unsure of sample size for HBCD.		
	Metric 16:	Adequacy of Test Conditions	Low	× 1	3	no information on experimental housing conditions.		
Domain 5: Outco	ome Assessme	$\operatorname{ent}$						
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	$^2$	See note '**' at the bottom of the table.		
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.		
Domain 6: Confe	ounding / Var	iable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note *** at the bottom of the table.		
	Metric 20:	Outcomes Unrelated to Exposure	Medium	$\times$ 1	2	Not reported.		
Domain 7: Data	Presentation	and Analysis						
	Metric 21:	Statistical Methods	High	$\times 1$	1	See note '**' at the bottom of the table.		
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.		
Overall Quality l	Determination	n <sup>‡</sup>	Unacceptable	· — Low	4.0			
Extracted			Yes					

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

 $<sup>^\</sup>dagger$  High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

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Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 3: Data Evaluation table for reference 1274149 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1274149).

Study Citation:	Anselmo, H. M. R., Koerting, L., Devito, S., van den Berg, J. H. J., Dubbeldam, M., Kwadijk, C., Murk, A. J 2011. Early life developmental effects of marine persistent organic pollutants on the sea urchin Psammechinus miliaris. Ecotoxicology and Environmental Safety 74:2182-2192								
Data Type: Hero ID:	Other; Aqu 1274149	atic; Invertebrates							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	Low	$\times$ 2	6	No CASRN or purity mentioned. Only cited that it is a technical mixture.			
	Metric 2:	Test Substance Source	Low	× 1	3	A gift from a professor. However, other chemicals in the study cited the source.			
	Metric 3:	Test Substance Purity	Low	× 1	3	No purity mentioned. Validation of the test substance is needed.			
Domain 2: Test I	Design								
	Metric 4:	Negative Controls	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.			
Domain 3: Expos	sure Characte	erization							
	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.			
Domain 4: Test (	Organism								
1, 1000	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times 1$	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			
		Continued on next page							

	continued from previous page									
Study Citation:  Data Type: Hero ID:	opmental ef Safety 74:21									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$Comments^{\dagger\dagger}$				
Domain 5: Outco	ome Assessme	ent								
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 18:	Consistency of Outcome Assessment	High	$\times$ 1	1	See note '**' at the bottom of the table.				
Domain 6: Confo	ounding / Var Metric 19:	riable Control Confounding Variables in Test Design and Procedures	High	× 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	$\times$ 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation Metric 21: Metric 22: Metric 23:	and Analysis Statistical Methods Reporting of Data Explanation of Unexpected Outcomes	High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 1 \end{array}$	1 2 1	See note "**" at the bottom of the table.  See note "**" at the bottom of the table.  See note "**" at the bottom of the table.				
Overall Quality I	Determination	i <sup>†</sup>	High		1.3					
Extracted			Yes							

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

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Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 4:\ Data\ Evaluation\ table\ for\ reference\ 1401837\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1401837).$ 

Study Citation:	Fernie, K. J., Marteinson, S. C., Bird, D. M., Ritchie, I. J., Letcher, R. J 2011. Reproductive changes in American kestrels (Falco sparverius) in relation to exposure to technical hexabromocyclododecane flame retardant. Environmental Toxicology and Chemistry 30:2570-2575								
Data Type: Hero ID:		21 days); Terrestrial; Birds							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$Comments^{\dagger\dagger}$			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	$_{ m High}$	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.			
Domain 2: Test I	Design								
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.			
Domain 3: Expos	ure Characte	erization							
zonam or zapos	Metric 7:	Experimental System/Test Media Preparation	Medium	$\times$ 2	4	Modified feeding diet and only one dose concentra- tion. However, this concentration was established in a previous study.			
	Metric 8:	Consistency of Exposure Administration	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	$\times$ 1	2	Number of paired birds were not stated in this paper but the methods were referenced in a previous study.			
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Source states that the level of HBCD exposure we slightly higher that the environmental concentrations.			
Domain 4: Test (	Organism								
	Metric 13:	Test Organism Characteristics	Medium	$\times$ 2	4	Study used a different species that is normally recommended for this type of study.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			
		Continued on next page							

Study Citation:	sparverius)	Fernie, K. J., Marteinson, S. C., Bird, D. M., Ritchie, I. J., Letcher, R. J 2011. Reproductive changes in American kestrels (Falco sparverius) in relation to exposure to technical hexabromocyclododecane flame retardant. Environmental Toxicology and Chemistry 30:2570-2575								
Data Type:	Chronic (>:	21 days); Terrestrial; Birds								
Hero ID:	1401837									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
Domain 5: Outco	ome Assessme	ent								
Domain or o area	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
Domain 6: Confo	ounding / Var	iable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	$\stackrel{\circ}{\mathrm{High}}$	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality I	Determination	, <sup>‡</sup>	High		1.2					
Extracted			Yes							

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} \end{array} \right. \\ \text{(round to the nearest tenth) otherwise} \quad ,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>&</sup>lt;sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 5:\ Data\ Evaluation\ table\ for\ reference\ 1403364\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1403364).$ 

Study Citation:								
D ( T	-	hexabromocyclododecane (HBCD). Chemosphe	re 80:165-1	69				
Data Type: Hero ID:	Chronic (> 1403364	21 days); Aquatic; Fish						
Tiero ID.								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>		
Domain 1: Test S	Substance							
Domesti 1. 1000 i	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 2:	Test Substance Source	Low	× 1	3	The HBCD isomer source was not provided.		
	Metric 3:	Test Substance Purity	Low	× 1	3	Very little information is provided by the authors on the HBCD used in these experiments; purity not provided.		
Domain 2: Test I	Design							
1.000 1	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.		
Domain 3: Expos	sure Characte	erization						
	Metric 7:	Experimental System/Test Media Preparation	Low	$\times$ 2	6	Experimental conditions were not explained as fully as the acclimatization period and it isn't clear whether the experiments were run via static or flow-through conditions, and if leftover food was removed from the tanks after the feedings.		
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Only nominal concentrations for oral exposure provided.		
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.		
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	HBCD was mixed in with the pellet food.		
Domain 4: Test (	Organism							
	Metric 13:	Test Organism Characteristics	High	$\times \ 2$	2	See note '**' at the bottom of the table.		
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.		
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	No true replicates were used. Twenty fish per exposure treatment (one rep per exposure group) were used.		
		Continued on next page						

Study Citation:	, , ,	Palace, V.,Park, B.,Pleskach, K.,Gemmill, B.,Tomy, G. 2010. Altered thyroxine metabolism in rainbow trout (Oncorhynchus mykiss) exposed to hexabromocyclododecane (HBCD). Chemosphere 80:165-169								
Data Type: Hero ID:	Chronic (>: 1403364	21 days); Aquatic; Fish								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$				
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	No details on water conditions, temperature, etc. of the experiment. The main details in the methods specifically addressed the feed preparations and dos- ing.				
Domain 5: Outco	ome Assessme	nt								
	Metric 17:	Outcome Assessment Methodology	$_{ m High}$	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
Domain 6: Confo	ounding / Var	iable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality I	Determination	‡	High		1.4					
Extracted			Yes							

 $<sup>\</sup>star$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 6:\ Data\ Evaluation\ table\ for\ reference\ 1403482\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1403482).$ 

Study Citation:		- · · · · · · · · · · · · · · · · · · ·	. ,			success, isomer-specific accumulation, and hepatic
	_	ression in chicken embryos exposed to HBCD. T	Coxicologie	cal Scien	ces 115:	492-500
Data Type:	`	21 days); Terrestrial; Birds				
Hero ID:	1403482					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test l	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain J. Empo.	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion				
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentra-	High	$\times$ 1	1	See note '**' at the bottom of the table.
	7.5 . 10	tion	TT: 1	. 0	0	
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times 1$	1	See note *** at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 4: Test 6	~					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note "**" at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	$\operatorname{High}$	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note "**" at the bottom of the table.
Domain 5: Outco	mo Aggagam	ont				
Domain 5: Outco	ome Assessme Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 17:	Consistency of Outcome Assessment	High	$\times$ 2 $\times$ 1	1	See note *** at the bottom of the table.
			111211	^ 1	1	decinate at the pottom of the table.
		Continued on next page				

Study Citation:		Crump, D., Egloff, C., Chiu, S., Letcher, R. J., Chu, S., Kennedy, S. W. 2010. Pipping success, isomer-specific accumulation, and hepatic mRNA expression in chicken embryos exposed to HBCD. Toxicological Sciences 115:492-500								
Data Type: Hero ID:	Chronic (>: 1403482	Chronic (>21 days); Terrestrial; Birds 1403482								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
Domain 6: Confounding / Variable Control										
	Metric 19:	Confounding Variables in Test Design and	High	$\times 2$	2	See note *** at the bottom of the table.				
		Procedures								
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note (***) at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note "**" at the bottom of the table.				
Overall Quality Determination <sup>‡</sup>			High		1.0					
Extracted			Yes							

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 7:\ Data\ Evaluation\ table\ for\ reference\ 1408111\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1408111).$ 

Study Citation:		Chiu, S., Egloff, C., Kennedy, S. W 2008. Ef ression in chicken (Gallus domesticus) hepatocy				
Data Type: Hero ID:		6 hour); Terrestrial; Birds		O		
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Low	× 1	3	The purity was not reported.
Domain 2: Test l	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Medium	× 1	2	It wasn't reported whether cells were randomly collected from chicken embryos, and distributed into exposure treatments.
Domain 3: Expos	euro Characti	ovization				
Domain 5. Expo	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Nominal concentrations were reported.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Domain 4: Test	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
		Continued on next page				

Study Citation:	Study Citation: Crump, D., Chiu, S., Egloff, C., Kennedy, S. W 2008. Effects of hexabromocyclododecane and polybrominated diphenyl ethers or mRNA expression in chicken (Gallus domesticus) hepatocytes. Toxicological Sciences 106:479-487									
Data Type: Hero ID:	Acute (0-96 hour); Terrestrial; Birds 1408111									
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>				
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
Domain 6: Confo	ounding / Var	riable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality I	Determination	ı <sup>‡</sup>	High		1.2					
Extracted			Yes							

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table~8:~Data~Evaluation~table~for~reference~1409610~(https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1409610).$ 

Study Citation:	Palace, V. P.,Pleskach, K.,Halldorson, T.,Danell, R.,Wautier, K.,Evans, B.,Alaee, M.,Marvin, C.,Tomy, G. T 2008. Biotransformation enzymes and thyroid axis disruption in juvenile rainbow trout (Oncorhynchus mykiss) exposed to hexabromocyclododecane diastereoisomers. Environmental Science and Technology 42:1967-1972								
Data Type: Hero ID:	Chronic (> 1409610	21 days); Aquatic; Fish							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$			
Domain 1: Test S	ubstance								
	Metric 1:	Test Substance Identity	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	See note *** at the bottom of the table.			
Domain 2: Test D	Design								
	Metric 4:	Negative Controls	Medium	$\times$ 2	4	Authors reported having a reference diet, but specific methods were only referenced from another publication;.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	Low	× 1	3	There was no report on how organisms were allocated to study groups.			
Domain 3: Expos	ure Characte	erization							
	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	diet-exposure			
Domain 4: Test C	Organism								
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	Medium	$\times$ 1	2	Fish were acclimatized for 7 days prior to the start of the experiment. No further details reported on acclimatization.			
		Continued on next page							

Study Citation:	mation enz	P.,Pleskach, K.,Halldorson, T.,Danell, R.,Waut ymes and thyroid axis disruption in juvenile ra	ainbow trou	it (Oncoi		, , , , , , , , , , , , , , , , , , , ,
Data Type: Hero ID:		mers. Environmental Science and Technology 4 21 days); Aquatic; Fish	2:1967-1972	2		
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Only one true replicate or tank per treatment. Four fish from each tank were sacrificed on days 0, 7, 14, and 56 of the uptake phase and days 7, 14, 56, and 112 of the depuration phase.
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 5: Outco			TT: 1	0	0	
	Metric 17: Metric 18:	Outcome Assessment Methodology Consistency of Outcome Assessment	High	$\begin{array}{c} \times \ 2 \\ \times \ 1 \end{array}$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confo	unding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	High	$\times$ 1	1	See note '**' at the bottom of the table.
D : 7 D : 1	D	1 4 1 .				
Domain 7: Data	Presentation Metric 21:	and Analysis Statistical Methods	Medium	× 1	2	Chatistic models la more referred to book and also
	Metric 21.	Statistical Methods	Medium	× 1	2	Statistic methods were referred to, but not adequately described.
	Metric 22:	Reporting of Data	High	$\times~2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality I	Determination	, <sup>‡</sup>	High		1.2	
Extracted			Yes			
		Continued on next page				

Study Citation: Palace, V. P., Pleskach, K., Halldorson, T., Danell, R., Wautier, K., Evans, B., Alaee, M., Marvin, C., Tomy, G. T.. 2008. Biotransfor-

mation enzymes and thyroid axis disruption in juvenile rainbow trout (Oncorhynchus mykiss) exposed to hexabromocyclododecane

diastereoisomers. Environmental Science and Technology 42:1967-1972

Hero ID: 1409610

Data Type:

Domain Metric Rating<sup>†</sup> MWF\* Score Comments<sup>††</sup>

Chronic (>21 days); Aquatic; Fish

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

where High= $\geq 1$  to < 1.7; Medium = $\geq 1.7$  to < 2.4; Low = $\geq 2.4$  to < 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

<sup>\*</sup> MWF = Metric Weighting Factor

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

 $Table\ 9:\ Data\ Evaluation\ table\ for\ reference\ 1412194\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1412194).$ 

21 days); Aquatic; Fish  Metric  Test Substance Identity Test Substance Source	Rating <sup>†</sup>	MWF*	Score	
Test Substance Identity Test Substance Source	$\mathrm{Rating}^{\dagger}$	MWF*	Score	
Test Substance Source			20010	Comments <sup>††</sup>
Test Substance Source				
	Low	$\times 2$	6	No information provided about the toxicant.
	Low	$\times 1$	3	no source mentioned
Test Substance Purity	Low	× 1	3	source not mentioned, no information on chemical purity
Negative Controls	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.
Negative Control Response	Unacceptable		4	Biological responses of the negative control groups (s) or treatment groups were not reported.
Randomized Allocation	Low	$\times$ 1	3	There was no report on how organisms were allocated to study groups.
rization				
Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
Measurement of Test Substance Concentration	Medium	× 1	2	Only nominal concentrations were reported, but flow through system may have kept the exposure concen- trations consistent throughout the exposure period.
Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	Two exposure treatments represented either an environmentally-relevant concentration, or a higher concentration (magnitude higher). Solvent controls for both HBCD treatment groups were also used (two different concentrations of acetone). Although only two concentrations were used, these were justified by the author.
Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Test Organism Characteristics	Medium	$\times$ 2	4	No information besides female fish being used for HBCD exposures (e.g., age, size).
	sting at or Below Solubility Limit st Organism Characteristics  Continued on next page	st Organism Characteristics Medium	st Organism Characteristics Medium $ imes 2$	st Organism Characteristics Medium $ imes 2$ 4

		continued from previous page				
Study Citation:	of the three	O.,Williams, T. D.,Allen, Y.,Katsiadaki, I.,Chipr -spine stickleback (Gasterosteus aculeatus) after al 34:310-317				-
Data Type:	Chronic (>	21 days); Aquatic; Fish				
Hero ID:	1412194	<b>,</b> , , , , , , , , , , , , , , , , , ,				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
Domain o. Outco	Metric 17:	Outcome Assessment Methodology	Medium	$\times$ 2	4	It wasn't explained why HBCD treatment only used female stickleback livers.
	Metric 18:	Consistency of Outcome Assessment	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 6: Confo	unding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Health outcomes unrelated to exposure were not reported.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality Determination <sup>‡</sup>		Unacceptable	$\longrightarrow$ Low	4.0		
Extracted			No			
		Continued on next page				

Study Citation: Aniagu, S. O., Williams, T. D., Allen, Y., Katsiadaki, I., Chipman, J. K.. 2008. Global genomic methylation levels in the liver and gonads

of the three-spine stickleback (Gasterosteus aculeatus) after exposure to hexabromocyclododecane and 17-beta oestradiol. Environment

International 34:310-317

Data Type: Chronic (>21 days); Aquatic; Fish

Hero ID: 1412194

Domain Metric Rating<sup>†</sup> MWF\* Score Comments<sup>††</sup>

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.$$

where High= $\geq 1$  to < 1.7; Medium = $\geq 1.7$  to < 2.4; Low = $\geq 2.4$  to < 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

<sup>\*</sup> MWF = Metric Weighting Factor

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

 $Table\ 10:\ Data\ Evaluation\ table\ for\ reference\ 1412802\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1412802).$ 

Study Citation:	D., 2007. L	V., Cantón, R. F., Leonards, P. E., Jenssen, B. M., cong-term exposure of European flounder (Platic	chthys fles	us) to th	e flame	-retardants tetrabromobisphenol A (TBBPA) a
Data Type: Hero ID:		cyclododecane (HBCD). Ecotoxicology and Env 21 days); Aquatic; Fish	ıronmenta	al Salety	b7:349- 	360
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Low	× 1	3	There was no report on how organisms were allocated to study groups.
Domain 3: Expo	sure Characte	prization				
Domain o. Expo	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Low	$\times$ 1	3	Test substance was not measured in the exposure medium.
	Metric 10:	Exposure Duration and Frequency	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	Exposure was through spiked sediment and food.
Domain 4: Test	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	$\times$ 1	3	It was not mentioned if the flounder were acclimated to the experiment conditions.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note *** at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.

: Kuiper, R. V., Cantón, R. F., Leonards, P. E., Jenssen, B. M., Dubbeldam, M., Wester, P. W., van den Berg, M., Vos, J. G., Vethaak D 2007. Long-term exposure of European flounder (Platichthys flesus) to the flame-retardants tetrabromobisphenol A (TBBPA)								
		ironmenta	al Safety	67:349-	360			
	Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
ome Assessme	nt							
Metric 17:	Outcome Assessment Methodology	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.			
Metric 18:	Consistency of Outcome Assessment	High	× 1	11	See note '**' at the bottom of the table.			
unding / Var	iable Control							
Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
Metric 20:	Outcomes Unrelated to Exposure	High	$\times$ 1	1	See note '**' at the bottom of the table.			
Presentation	and Analysis							
Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.			
Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Determination	‡	High		1.3				
		Yes						
]	D 2007. L. hexabromod Chronic (>2 1412802 cme Assessme Metric 17: Metric 18: unding / Var Metric 19: Metric 20: Presentation Metric 21: Metric 22: Metric 23:	D 2007. Long-term exposure of European flounder (Platic hexabromocyclododecane (HBCD). Ecotoxicology and Env Chronic (>21 days); Aquatic; Fish 1412802  Metric  Metric  Metric 17: Outcome Assessment Methodology Metric 18: Consistency of Outcome Assessment  unding / Variable Control  Metric 19: Confounding Variables in Test Design and Procedures  Metric 20: Outcomes Unrelated to Exposure  Presentation and Analysis  Metric 21: Statistical Methods  Metric 22: Reporting of Data	D 2007. Long-term exposure of European flounder (Platichthys fless hexabromocyclododecane (HBCD). Ecotoxicology and Environmental Chronic (>21 days); Aquatic; Fish 1412802  Metric Rating†  Metric 17: Outcome Assessment Methodology High Metric 18: Consistency of Outcome Assessment High  unding / Variable Control Metric 19: Confounding Variables in Test Design and High Procedures Metric 20: Outcomes Unrelated to Exposure High  Presentation and Analysis Metric 21: Statistical Methods High Metric 22: Reporting of Data High Metric 23: Explanation of Unexpected Outcomes High	D 2007. Long-term exposure of European flounder (Platichthys flesus) to the hexabromocyclododecane (HBCD). Ecotoxicology and Environmental Safety Chronic (>21 days); Aquatic; Fish 1412802  Metric Rating† MWF*  Metric 17: Outcome Assessment Methodology High × 2 Metric 18: Consistency of Outcome Assessment High × 1  unding / Variable Control  Metric 19: Confounding Variables in Test Design and High × 2  Procedures  Metric 20: Outcomes Unrelated to Exposure High × 1  Presentation and Analysis  Metric 21: Statistical Methods High × 2  Metric 22: Reporting of Data High × 2  Metric 23: Explanation of Unexpected Outcomes High × 1  Determination‡ High	D 2007. Long-term exposure of European flounder (Platichthys flesus) to the flame hexabromocyclododecane (HBCD). Ecotoxicology and Environmental Safety 67:349-Chronic (>21 days); Aquatic; Fish 1412802  Metric Rating† MWF* Score  Metric 17: Outcome Assessment Methodology High × 2 2 Metric 18: Consistency of Outcome Assessment High × 1 1  unding / Variable Control  Metric 19: Confounding Variables in Test Design and High × 2 2 Procedures  Metric 20: Outcomes Unrelated to Exposure High × 1 1  Presentation and Analysis  Metric 21: Statistical Methods High × 2 2 Metric 23: Explanation of Unexpected Outcomes High × 1 1  Determination <sup>‡</sup> High 1.3			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool.(a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table~11:~Data~Evaluation~table~for~reference~1443861~(https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1443861).$ 

Study Citation:	Law, K., Palace, V. P., Halldorson, T., Danell, R., Wautier, K., Evans, B., Alaee, M., Marvin, C., Tomy, G. T 2006. Dietary accumulation of hexabromocyclododecane diastereoisomers in juvenile rainbow trout (Oncorhynchus mykiss). I: Bioaccumulation parameters and evidence of bioisomerization. Environmental Toxicology and Chemistry 25								
Data Type: Hero ID:	Chronic (>) 1443861	21 days); Aquatic; Fish							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$Comments^{\dagger\dagger}$			
Domain 1: Test	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times 1$	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.			
Domain 2: Test	Design								
	Metric 4:	Negative Controls	High	$\times$ 2	$^2$	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	Unacceptable		4	not reported			
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.			
Domain 3: Expo	sure Characte	erization							
	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note *** at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	Diet exposure			
Domain 4: Test	Organism								
	Metric 13:	Test Organism Characteristics	Medium	$\times$ 2	4	Besides fish weight, there is no indication of source age, gender, or other characteristics of the test or ganisms.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	N/A		N/A	Purpose of study wasn't to get a dose response; only one exposure tank per isomer.			
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.			

		continued from previous page								
Study Citation:	of hexabron evidence of	lace, V. P., Halldorson, T., Danell, R., Wautier, K nocyclododecane diastereoisomers in juvenile rabioisomerization. Entre Property of the Pro	ainbow trout (	Oncorhyncl						
Data Type: Hero ID:										
Domain	Metric Rating <sup>†</sup> MWF* Score Comments									
Domain 5: Outco	ome Assessme	$\operatorname{ent}$								
	Metric 17:	Outcome Assessment Methodology	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
Domain 6: Confo	ounding / Var	riable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	none reported				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality Determination <sup>‡</sup>		Unacceptable	$\rightarrow$ Low	4.0						
Extracted			No							

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 12:\ Data\ Evaluation\ table\ for\ reference\ 1927533\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927533).$ 

Study Citation:				low-level	hexabro	omocyclododecane (HBCD) exposure on cardiac
D ( T	-	t in zebrafish embryos. Ecotoxicology 22:1200-1	207			
Data Type: Hero ID:	Acute (0-96 1927533	hour); Aquatic; Fish				
	1921000					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	ubstance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	)esion					
Domain 2. 1030 L	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	× 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Low	× 1	3	Embryo treatment allocation was not reported.
Domain 3: Expos	uro Characte	nization				
Domain 5: Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
	Weethe 7.	tion	IIIgii	^ 2	2	see note wat the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Nominal concentrations used, but 2 water changes per day alleviates some concern.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Some exposure concentrations above water solubility.
Domain 4: Test C	)raaniem					
Domain 4. 16st C	Metric 13:	Test Organism Characteristics	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\stackrel{\wedge}{\times} \stackrel{2}{1}$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1 $\times$ 1	1	See note '**' at the bottom of the table.
		Group	0	,, <u>+</u>	•	as the seven of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent.				
Demail of Guido	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:		o, Z.,Li, B.,Huang, L.,Chen, M.,Wang, C. 2013. t in zebrafish embryos. Ecotoxicology 22:1200-1		low-level	hexabro	omocyclododecane (HBCD) exposure on cardiac				
Data Type:	Acute (0-96 hour); Aquatic; Fish									
Hero ID:	1927533	,,								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
Domain 6: Confe	ounding / Va	sighla Control								
Domain o. Come	Metric 19:	Confounding Variables in Test Design and	High	$\times$ 2	2	See note '**' at the bottom of the table.				
		Procedures	O							
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	No differences in organism health reported.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times~2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality l	Determinatio	n <sup>‡</sup>	High		1.2					
Extracted		-	Yes	***************************************		-				

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 13: Data Evaluation table for reference 1927579 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927579).

Study Citation:	Du, M.,Lin, L.,Yan, C.,Zhang, X 2012. Diastereoisomer- and enantiomer-specific accumulation, depuration, and bioisomerization of hexabromocyclododecanes in zebrafish (Danio rerio). Environmental Science and Technology 46:11040-11046								
Data Type: Hero ID:		21 days); Aquatic; Fish							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	Low	× 1	3	Percent purity not provided.			
Domain 2: Test I	Design								
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	Low	× 1	3	Uncertain of whether organisms were randomly allocated to treatment groups.			
Domain 3: Expos	ure Characte	prization							
Domain o. Expos	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note *** at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	food exposure; amount of HBCD in control food was ND.			
Domain 4: Test C	)rganism								
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	There was only one tank per exposure. No true replicates to characterize toxicological effects, but this wasn't the study goal (uptake/depuration study).			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			
Domain 5: Outco	me Assessme	ent							
		Continued on next page							

Study Citation:	Du, M., Lin, L., Yan, C., Zhang, X 2012. Diastereoisomer- and enantiomer-specific accumulation, depuration, and bioisomerization of hexabromocyclododecanes in zebrafish (Danio rerio). Environmental Science and Technology 46:11040-11046								
Data Type: Hero ID:		21 days); Aquatic; Fish				G.			
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.			
Domain 6: Confe	ounding / Var	iable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	No health outcomes reported.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality l	Determination	ı <sup>‡</sup>	High		1.2				
Extracted			Yes						

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 14:\ Data\ Evaluation\ table\ for\ reference\ 1927583\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927583).$ 

Study Citation:	Wu, T., Wang, S., Huang, H., Zhang, S 2012. Diastereomer-Specific Uptake, Translocation, and Toxicity of Hexabromocyclododecane Diastereoisomers to Maize. Journal of Agricultural and Food Chemistry 60:8528-8534								
Data Type: Hero ID:		hour); Terrestrial; other Plant: Maize	on Chemise.	19 00.002	0004				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 1: Test S	ubstance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	Medium	× 1	2	Purity not reported			
Domain 2: Test D	)esign								
21 2000 20	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	Low	$\times$ 1	3	Allocation was not reported.			
D	Cl								
Domain 3: Exposi	ure Characte Metric 7:	Experimental System/Test Media Prepara-	Medium	$\times 2$	4	Althorab 4-4 lutions was an all a second assessment			
	wethe 7.	tion	Medium	X 2	4	Although test solutions were renewed everyday, its not clear how the exposure solution was mixed into the soil.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	The amount of HBCD in soil was not measured; only nominal concentrations were provided.			
	Metric 10:	Exposure Duration and Frequency	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Nominal concentrations were used, so there is uncertainty to how much HBCD was actually present despite claiming to set the initial concentrations below water solubility.			
Domain 4: Test C	Organism								
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			

: Wu, T., Wang, S., Huang, H., Zhang, S 2012. Diastereomer-Specific Uptake, Translocation, and Toxicity of Hexabromocyclododecane							
	-	od Chemist	ry 60:852	28-8534			
	hour); Terrestrial; other Plant: Maize						
1927583							
	$\operatorname{Metric}$	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>		
ome Assessme	ent						
Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.		
Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.		
ounding / Var	riable Control						
Metric 19:	Confounding Variables in Test Design and	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Procedures						
Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	Information on attrition unrelated to exposure were not reported.		
Presentation	and Analysis						
Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.		
Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.		
Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.		
Overall Quality Determination <sup>‡</sup>				1.3			
		Yes					
	Diastereoise Acute (0-96 1927583  Diagram Assessme Metric 17: Metric 18:  Dunding / Van Metric 19:  Metric 20:  Presentation Metric 21: Metric 22: Metric 23:	Diastereoisomers to Maize. Journal of Agricultural and For Acute (0-96 hour); Terrestrial; other Plant: Maize 1927583  Metric  Metric  Metric 17: Outcome Assessment Methodology Metric 18: Consistency of Outcome Assessment  Multiple Control Metric 19: Confounding Variables in Test Design and Procedures  Metric 20: Outcomes Unrelated to Exposure  Presentation and Analysis  Metric 21: Statistical Methods  Metric 22: Reporting of Data  Metric 23: Explanation of Unexpected Outcomes	Diastereoisomers to Maize. Journal of Agricultural and Food Chemist Acute (0-96 hour); Terrestrial; other Plant: Maize 1927583  Metric Rating†  Metric 17: Outcome Assessment Methodology High Metric 18: Consistency of Outcome Assessment High  Multiple Procedures  Metric 20: Outcomes Unrelated to Exposure Medium  Presentation and Analysis Metric 21: Statistical Methods High Metric 22: Reporting of Data High Metric 23: Explanation of Unexpected Outcomes High	Diastereoisomers to Maize. Journal of Agricultural and Food Chemistry 60:852 Acute (0-96 hour); Terrestrial; other Plant: Maize 1927583  Metric Rating† MWF*  Ome Assessment  Metric 17: Outcome Assessment Methodology High × 2 Metric 18: Consistency of Outcome Assessment High × 1  Dounding / Variable Control  Metric 19: Confounding Variables in Test Design and High × 2  Procedures  Metric 20: Outcomes Unrelated to Exposure Medium × 1  Presentation and Analysis  Metric 21: Statistical Methods High × 2  Metric 22: Reporting of Data High × 2  Metric 23: Explanation of Unexpected Outcomes High × 1  Determination‡ High	Diastereoisomers to Maize. Journal of Agricultural and Food Chemistry 60:8528-8534 Acute (0-96 hour); Terrestrial; other Plant: Maize 1927583  Metric Rating† MWF* Score  Metric 17: Outcome Assessment Methodology High $\times$ 2 2 Metric 18: Consistency of Outcome Assessment High $\times$ 1 1  Dounding / Variable Control Metric 19: Confounding Variables in Test Design and High $\times$ 2 2 Procedures Metric 20: Outcomes Unrelated to Exposure Medium $\times$ 1 2  Presentation and Analysis Metric 21: Statistical Methods High $\times$ 2 2 Metric 22: Reporting of Data High $\times$ 2 2 Metric 23: Explanation of Unexpected Outcomes High $\times$ 1 1  Determination‡ High $\times$ 1 1  Determination‡ High $\times$ 1 1		

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ & \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table~15:~Data~Evaluation~table~for~reference~1927590~(https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927590).$ 

Study Citation:	Marteinson, S. C., Bird, D. M., Letcher, R. J., Sullivan, K. M., Ritchie, I. J., Fernie, K. J 2012. Dietary exposure to technical hexabro-mocyclododecane (HBCD) alters courtship, incubation and parental behaviors in American kestrels (Falco sparverius). Chemosphere 89:1077-1083								
Data Type: Hero ID:	Other; Terr 1927590	estrial; Birds							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	Technical grade			
Domain 2: Test I	Design								
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.			
Domain 3: Expos	ure Characte	erization							
Domain of Bripos	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	diet exposure; measured conc in egg to indicate exposure dose			
	Metric 10:	Exposure Duration and Frequency	High	$\times~2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	× 1	2	One dose tested			
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	diet exposure; measured conc in egg to indicate exposure dose			
Domain 4: Test (	Organism								
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\stackrel{\wedge}{\times} 1$	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			
Domain 5: Outco	me Assessme	${ m ent}$							
		Continued on next page							

Study Citation:	Marteinson, S. C., Bird, D. M., Letcher, R. J., Sullivan, K. M., Ritchie, I. J., Fernie, K. J. 2012. Dietary exposure to technical hexabro mocyclododecane (HBCD) alters courtship, incubation and parental behaviors in American kestrels (Falco sparverius). Chemospher 89:1077-1083							
Data Type: Hero ID:	Other; Terr 1927590	estrial; Birds						
Domain		Metric	Rating <sup>†</sup>	$\mathrm{MWF}^{\star}$	Score	Comments <sup>††</sup>		
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.		
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.		
Domain 6: Confo	ounding / Var	riable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.		
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.		
Domain 7: Data	Presentation	and Analysis						
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.		
Overall Quality I	Determination	n <sup>‡</sup>	High		1.1			
Extracted			Yes					

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 16:\ Data\ Evaluation\ table\ for\ reference\ 1927610\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927610).$ 

Study Citation:	Du, M.,Zha	ang, D., Yan, C., Zhang, X 2012. Developmenta	l toxicity e	valuation	of thre	e hexabromocyclododecane diastereoisomers on
		mbryos. Aquatic Toxicology				
Data Type:	Other;					
Hero ID:	1927610					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	)esion					
Domain 2. 1050 1	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	× 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
D . '. 9 E .	CI 4					
Domain 3: Expos	ure Characte Metric 7:		Medium	v 9	4	
	Metric 7:	Experimental System/Test Media Preparation	Medium	$\times 2$	4	Unsure of volatilization, and no water concentrations were measured (all nominal).
	Metric 8:	Consistency of Exposure Administration	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	nominal concentrations only reported
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Many exposure concentrations above water solubility of different hbcd stereoisomers.
Domain 4: Test (	Irganiem					
Domain 4. 16st (	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\stackrel{\wedge}{\times} \stackrel{2}{1}$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
	1.100110 10.	Group	-11011	/\ I	•	see less as the position of the sapic.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessma	ent				
Domain o. Outeo	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:		ng, D., Yan, C., Zhang, X 2012. Developmentanbryos. Aquatic Toxicology	l toxicity e	valuation	of thre	e hexabromocyclododecane diastereoisomers on
Data Type:	Other;					
Hero ID:	$19276\dot{1}0$					
Domain		$\operatorname{Metric}$	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confe	ounding / Var	riable Control				
Domain o. Come	Metric 19:	Confounding Variables in Test Design and	High	$\times~2$	2	See note '**' at the bottom of the table.
		Procedures				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note (***) at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality	Determination	n <sup>‡</sup>	High		1.2	
Extracted			Yes			

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 17:\ Data\ Evaluation\ table\ for\ reference\ 1927629\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927629).$ 

Study Citation:	on: Fournier, A., Feidt, C., Marchand, P., Vénisseau, A., Le Bizec, B., Sellier, N., Engel, E., Ratel, J., Travel, A., Jondreville, C. 2012. Kinetic study of "-hexabromocyclododecane orally given to laying hens (Gallus domesticus). "Transfer of HBCD in laying hens". Environmental Science and Pollution Research 19:440-447								
Data Type: Hero ID:		21 days); Terrestrial; Birds							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$Comments^{\dagger\dagger}$			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.			
Domain 2: Test I	Design								
	Metric 4:	Negative Controls	High	$\times \ 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.			
Domain 3: Expos	sure Characte	erization							
1	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	$\operatorname{High}$	$\times 2$	2	See note *** at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.			
Domain 4: Test 0	Organism								
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note *** at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note "**" at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			
Domain 5: Outco	ome Assessme	ent							
Domain o. Other	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.			
		Continued on next page							

Study Citation:	Fournier, A., Feidt, C., Marchand, P., Vénisseau, A., Le Bizec, B., Sellier, N., Engel, E., Ratel, J., Travel, A., Jondreville, C 2012. Kinetic study of "-hexabromocyclododecane orally given to laying hens (Gallus domesticus). "Transfer of HBCD in laying hens". Environmental Science and Pollution Research 19:440-447 Chronic (>21 days); Terrestrial; Birds 1927629								
Data Type: Hero ID:									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$			
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note "**" at the bottom of the table.			
Domain 6: Confe	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note *** at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality Determination <sup>‡</sup>		High		1.0					
Extracted			Yes						

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

 $<sup>^{\</sup>dagger}$  High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table~18:~Data~Evaluation~table~for~reference~1927697~(https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927697).$ 

Study Citation:	,	, , ,	oromocycl	lododeca	ne (HB	CDD) to the benthic clam Macoma balthica (L.)
D . T		altic Sea. Aquatic Toxicology 95:239-247				
Data Type: Hero ID:	Chronic (> 1927697	21 days); Aquatic; Invertebrates				
nero ID:	1921091					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	Low	$\times$ 1	3	not provided
	Metric 3:	Test Substance Purity	High	× 1	1	technical mixture of HBCDD
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Dominion of Emp	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion	0			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Low	× 1	3	nominal conc; measured gill tissue conc every $10$ days
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note *** at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	nominal conc; measured gill tissue conc every 10 days
Domain 4: Test (	)roanism					
1. 103t C	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times 1$	1	See note '** at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
		Group	-			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:	Smolarz, K.,Berger, A 2009. Long-term toxicity of hexabromocyclododecane (HBCDD) to the benthic clam Macoma balthica (L.) from the Baltic Sea. Aquatic Toxicology 95:239-247								
Data Type: Hero ID:		21 days); Aquatic; Invertebrates							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.			
Domain 6: Confo	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note *** at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note *** at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality I	Overall Quality Determination <sup>‡</sup>		High		1.3				
Extracted			Yes						

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 19:\ Data\ Evaluation\ table\ for\ reference\ 1927716\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927716).$ 

Study Citation:	Deng, J., Yu, L., Liu, C., Yu, K., Shi, X., Yeung, L. W., Lam, P. K., Wu, R. S., Zhou, B. 2009. Hexabromocyclododecane-induced developmental toxicity and apoptosis in zebrafish embryos. Aquatic Toxicology 93:29-36								
Data Type: Hero ID:		5 hour); Aquatic; Fish	e Toxicolog	5y 00.20-6	,0				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$Comments^{\dagger\dagger}$			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.			
Domain 2: Test I	Design								
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.			
Domain 3: Expos	sure Characte	erization							
Domain of Dip of	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	N/A		N/A	See note '**' at the bottom of the table.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Although the concentrations are above the water solubility for HBCD, DMSO was used as a solvent.			
Domain 4: Test C	Iraaniem								
Domain 4. 1est (	Metric 13:	Test Organism Characteristics	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\stackrel{\wedge}{\times} \stackrel{2}{1}$	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.			
Domain 5: Outco	me Assessme	ent.							
Domain o. Outco	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.			
		Continued on next page							

Study Citation:		, L.,Liu, C.,Yu, K.,Shi, X.,Yeung, L. W.,Lam, F city and apoptosis in zebrafish embryos. Aquat				09. Hexabromocyclododecane-induced develop-
Data Type:		hour); Aquatic; Fish		50		
Hero ID:	1927716					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 18:	Consistency of Outcome Assessment	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domein & Confe	ounding / Vox	siable Centual				
Domain 6: Confe	ounding / vai Metric 19:	Confounding Variables in Test Design and	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 13.	Procedures	mgn	^ 2	2	see note wat the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality I	Determination	n <sup>‡</sup>	High		1.0	
Extracted			Yes			

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 20:\ Data\ Evaluation\ table\ for\ reference\ 1927732\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927732).$ 

Study Citation:			e toxicity	of TBBP	'A and	HBCD by zebrafish embryo toxicity assay and
		analysis. Environmental Toxicology 24:334-342				
Data Type:	`	hour); Aquatic; Fish				
Hero ID:	1927732					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test 1	Design					
Domain 2. 1030	Metric 4:	Negative Controls	Medium	$\times 2$	4	Used DMSO as a solvent
	Metric 5:	Negative Control Response	Medium	× 1	$\overline{2}$	Used DMSO as a solvent
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sura Charact	arization				
Domain 6. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
	mound i.	tion	111911	/\ <u>L</u>	~	see hote the sottom of the tube.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Domain 4: Test	Organism					
Domain 4. 1030	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
		Group			_	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent.				
20111111110. 04100	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:  Data Type: Hero ID:	Hu, J., Liang, Y., Chen, M., Wang, X 2009. Assessing the toxicity of TBBPA and HBCD by zebrafish embryo toxicity assay and biomarker analysis. Environmental Toxicology 24:334-342 Acute (0-96 hour); Aquatic; Fish 1927732								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 6: Confo	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times 1$	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	imes 2	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality I	Overall Quality Determination <sup>‡</sup>		High		1.1				
Extracted			Yes						

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 21: Data Evaluation table for reference 1927768 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927768).

Study Citation:						nepatic enzymes and oxidative stress in Chinese
		w (Gobiocypris rarus) exposed to waterborne he	exabromocy	clododec	ane (HF	BCDD). Aquatic Toxicology 86
Data Type: Hero ID:	Chronic (> 1927768	21 days); Aquatic; Fish				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$
Domain 1: Test S	ubstance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
Domain 2. Test E	Metric 4:	Negative Controls	Medium	× 2	4	The control fish were exposed to the nominal concentration of 0.06" DMSO, corresponding to the highest percentage volume of DMSO used in the HBCDD treatments. Unsure of DMSO concentration or percentage volume in all treatment groups.
	Metric 5:	Negative Control Response	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported
Domain 3: Expos	uro Characte	orization				
Domain 5. Expos	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	Medium	× 1	2	Control fish were only exposed to one concentration of DMSO that corresponds with the nominal amount reported for the highest concentration of HBCD; unsure of solvent concentrations in other HBCD concentrations.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Only nominal concentrations used/reported.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Some exposure concentrations exceeded water solubility.
Domain 4: Test C	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:	0, ,	Yang, F., Zhang, X., Xu, Y., Liao, T., Song, S., Wa	0,			1 0
Data Type: Hero ID:		v (Gobiocypris rarus) exposed to waterborne he 21 days); Aquatic; Fish	exabromocy	ciododec	апе (пт	ocdb). Aquatic Toxicology 80
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	No mentioning of acclimatization and pre-treatment conditions, and DMSO concentrations may have dif- fered between treatments
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	45 fish were used per group, but the number of reps per exposure group was not explicitly mentioned. Also not sure if blood and serum samples were pooled for analysis between time sampling points.
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 5: Outco				_	_	
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confo	unding / Var	iable Control				
Bomain o. Como	Metric 19:	Confounding Variables in Test Design and Procedures	Medium	$\times$ 2	4	DMSO concentration differ between treatment groups,.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation Metric 21:	and Analysis Statistical Methods	TT:1.	v. 1	1	
	Metric 21: Metric 22:	Reporting of Data	High High	$egin{smallmatrix}  imes 1 \  imes 2 \end{bmatrix}$	$\frac{1}{2}$	See note '**' at the bottom of the table.  See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	$\begin{array}{c} \times \ 2 \\ \times \ 1 \end{array}$	1	See note '**' at the bottom of the table.
	Wethe 20.	Explanation of enexpected Outcomes	111511			See note at the bottom of the table.
Overall Quality I	Determination	,‡	High		1.5	
Extracted			Yes			
		Continued on next page				

Study Citation: Zhang, X., Yang, F., Zhang, X., Xu, Y., Liao, T., Song, S., Wang, J. 2008. Induction of hepatic enzymes and oxidative stress in Chinese

rare minnow (Gobiocypris rarus) exposed to waterborne hexabromocyclododecane (HBCDD). Aquatic Toxicology 86

Data Type: Chronic (>21 days); Aquatic; Fish

Hero ID: 1927768

Domain Metric Rating<sup>†</sup> MWF\* Score Comments<sup>††</sup>

 $^{\star}$  MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

where High= $\geq 1$  to < 1.7; Medium = $\geq 1.7$  to < 2.4; Low = $\geq 2.4$  to < 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 22:\ Data\ Evaluation\ table\ for\ reference\ 1927821\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927821).$ 

Study Citation:	itation: Ronisz, D., Finne, E. F., Karlsson, H., Förlin, L 2004. Effects of the brominated flame retardants hexabromocyclododecane (HBC and tetrabromobisphenol A (TBBPA), on hepatic enzymes and other biomarkers in juvenile rainbow trout and feral eelpout. A							
	Toxicology		and other	Diomai Ke	as m ju	venne rambow trout and teral eerpout. Aquatic		
Data Type:	Other; Aqu							
Hero ID:	1927821	,						
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>		
Domain 1: Test S	Substance							
	Metric 1:	Test Substance Identity	High	$\times$ 2	2	See note '**' at the bottom of the table.		
	Metric 2:	Test Substance Source	Medium	$\times$ 1	2	Source provided but not additional information		
	Metric 3:	Test Substance Purity	Low	$\times$ 1	3	Grade/Purity not reported		
Domain 2: Test l	Design							
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation not reported		
Domain 3: Expos	sure Characte	erization						
т	Metric 7:	Experimental System/Test Media Preparation	High	imes 2	2	See note '**' at the bottom of the table.		
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	nominal injection studies		
	Metric 10:	Exposure Duration and Frequency	High	$\times \ 2$	2	See note '**' at the bottom of the table.		
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.		
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	nominal injection studies		
Domain 4: Test	Organism							
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.		
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note *** at the bottom of the table.		
Domain 5: Outco	ome Assessme	ent						
_ 311311 31 34100	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.		
		Continued on next page						

Study Citation:  Data Type: Hero ID:	and tetrabr Toxicology	Ronisz, D., Finne, E. F., Karlsson, H., Förlin, L. 2004. Effects of the brominated flame retardants hexabromocyclododecane (HBCDD), and tetrabromobisphenol A (TBBPA), on hepatic enzymes and other biomarkers in juvenile rainbow trout and feral eelpout. Aquatic Toxicology 69:229-245 Other; Aquatic; Fish 1927821								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
Domain 6: Confe	ounding / Var	riable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality I	Determination	<b>1</b>	High		1.3					
Extracted			Yes							

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 23: Data Evaluation table for reference 1927837 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927837).

Study Citation:		E., Yoder, M. J., McLaughlin, L. L., Lores, E. I in six growth media. Ecotoxicology and Enviro				marine unicellular algae to brominated organic
Data Type: Hero ID:	-	5 hour); Aquatic; Plants		outouy 11		_
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
2020	Metric 1:	Test Substance Identity	High	$\times$ 2	2	This study was conducted by the U.S. Environmental Protection Agency (Environmental Research Laboratory, Gulf Breeze, Florida). Although the reporting source for this study lack specific details about the test substance, the information on this metric can be found in other sources.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Low	× 1	3	This study was conducted by the U.S. Environmental Protection Agency (Environmental Research Laboratory, Gulf Breeze, Florida). Although the reporting source for this study lack specific details about the test substance, the information on this metric can be found in other sources.
Domain 2: Test l	Dosion					
Domain 2. Test	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	× 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	suro Characto	prization				
Domain o. Expo.	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note *** at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Domain 4: Test	Organism					
2 5 11 10 10 10 10 10 10 10 10 10 10 10 10	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
		Continued on next page				

vth media. Ecotoxicology and Envirouatic; Plants  Metric	Rating <sup>†</sup>			
Metric	Rating <sup>†</sup>	MWF*		
	Rating <sup>†</sup>	MWF*		
	Rating	MWF*		~
			Score	Comments <sup>††</sup>
zation and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
of Organisms and Replicates per	High	× 1	1	See note '**' at the bottom of the table.
or organisms and respired to per	111011	, · · ·	-	
y of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
ncy of Outcome Assessment	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.
1				
rol	TT' 1	0	0	
es randles in Test Design and	High	× 2	2	See note '**' at the bottom of the table.
s Unrelated to Exposure	High	× 1	1	See note "**" at the bottom of the table.
sis				
	High	× 1	1	See note '**' at the bottom of the table.
g of Data	~		2	See note '**' at the bottom of the table.
	N/A		N/A	See note '**' at the bottom of the table.
ion of Unexpected Outcomes				
ion of Unexpected Outcomes	High		1 1	
on of Unexpected Outcomes	High		1.1	
1	s Unrelated to Exposure sis l Methods	es s Unrelated to Exposure High sis ll Methods High High G of Data High	es s Unrelated to Exposure $\frac{1}{2}$ High $\frac{1}{2}$ High $\frac{1}{2}$ High $\frac{1}{2}$ High $\frac{1}{2}$ High $\frac{1}{2}$	es s Unrelated to Exposure High $\times$ 1 1  sis ld Methods High $\times$ 1 1  g of Data High $\times$ 2 2

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

where High = 2 1 to < 1.7; Medium = 2 1.7 to < 2.4; Low = 2.4 to < 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 24: Data Evaluation table for reference 1927956 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1927956).

Study Citation:		•				fication and olfactory function in Atlantic salmon
	•	r L.) smolts. Marine and Freshwater Behaviour	and Phys	siology 4	0:267-28	34
Data Type:	,	21 days); Aquatic; Fish				
Hero ID:	1927956					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	Technical grade.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain o. Expo	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion	0			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentra-	High	$\times$ 1	1	See note "**" at the bottom of the table.
	Metric 10:	tion Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 10:	Number of Exposure Groups/Spacing of Ex-	nign High	$\times$ 2 $\times$ 1	1	See note '**' at the bottom of the table.
	Metric 11.	posure Levels	ingn	× 1	1	See note at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 4: Test (	~					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times 1$	1	See note *** at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note "**" at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note "**" at the bottom of the table.
		Continued on next page				

Study Citation:		Lower, N., Moore, A 2007. The impact of a brominated flame retardant on smoltification and olfactory function in Atlantic salmon (Salmo salar L.) smolts. Marine and Freshwater Behaviour and Physiology 40:267-284								
Data Type: Hero ID:	Chronic (>: 1927956	21 days); Aquatic; Fish								
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
Domain 6: Confo	ounding / Var	riable Control								
	Metric 19:	Confounding Variables in Test Design and	High	$\times 2$	2	See note '**' at the bottom of the table.				
		Procedures								
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality I	Overall Quality Determination <sup>‡</sup>		High		1.0					
Extracted			Yes							

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 25:\ Data\ Evaluation\ table\ for\ reference\ 1928024\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1928024).$ 

Study Citation:	40.7	ni,Pan, L.,Tao, Y.,Tian, S.,Hu, Y 2013. Ident um in response to environmental pollutant hexal 5:166-173				
Data Type: Hero ID:		atic; Sediment-dwelling				
Domain		Metric	$\mathrm{Rating}^{\dagger}$	MWF*	Score	${\rm Comments}^{\dagger\dagger}$
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	Unacceptable		4	no mention of HBCD source, purity, or structure
	Metric 2:	Test Substance Source	Low	$\times$ 1	3	no mention of HBCD source, purity, or structure
	Metric 3:	Test Substance Purity	Low	× 1	3	no mention of HBCD source, purity, or structure
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	Unacceptable		4	biological responses of control not reported
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
	Metric 7:	Experimental System/Test Media Preparation	Medium	$\times$ 2	4	Some information provided, but no details available on reducing HBCD loss.
	Metric 8:	Consistency of Exposure Administration	Low	× 1	3	not many details on exposure administration beside the daily static renewals
	Metric 9:	Measurement of Test Substance Concentration	Medium	$\times$ 1	2	only nominal concentrations provided
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note "** at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Only nominal concentrations provided but one concentration reported to be above water solubility
Domain 4: Test (	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.

Study Citation:	philippinaru Ecology 445					
Data Type: Hero ID:	Other; Aqua 1928024	atic; Sediment-dwelling				
Domain	1020021	Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 5: Outco	ome Assessme	ent.				
Domain 5. Outo	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confe	ounding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	Medium	$\times$ 1	2	no unrelated outcomes were reported
Domain 7: Data	Presentation	and Analysis				
Domain 1. Data	Metric 21:	Statistical Methods	High	× 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	$\tilde{2}$	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality l	Determination	i <sup>‡</sup>	Unacceptable		4.0	
Extracted			Yes			

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to have a substantial impact on the results [score of 2]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 26:\ Data\ Evaluation\ table\ for\ reference\ 1928244\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1928244).$ 

Study Citation:		TTER FROM AMER CHEM CNCL SUBMIT of END-USER SURVEY-PHASE 1 STUDY OF				
Data Type: Hero ID:	Acute (0-96 1928244	3 hour); Aquatic; Fish				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$Comments^{\dagger\dagger}$
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 2: Test l	Design					
1501110111 21 1000	Metric 4:	Negative Controls	Low	$\times 2$	6	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	Low	× 1	3	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Low	× 1	3	See note '**' at the bottom of the table.
Domain 3: Expos	sura Characta	prization				
Domain o. Expo	Metric 7:	Experimental System/Test Media Preparation	Low	$\times$ 2	6	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	Low	$\times$ 1	3	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Low	$\times$ 1	3	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	Low	$\times 2$	6	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Low	× 1	3	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	See note '**' at the bottom of the table.
Domain 4: Test (	Organism					
Domain i. 1000	Metric 13:	Test Organism Characteristics	Low	$\times 2$	6	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	× 1	3	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	Low	$\times$ 1	3	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	Low	× 1	3	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent.				
Domain 6. Outo	Metric 17:	Outcome Assessment Methodology	Low	$\times$ 2	6	See note '**' at the bottom of the table.
		Continued on next page				

		continued from previous page				
Study Citation:	TROUT an 8/28/00.	TTER FROM AMER CHEM CNCL SUBMIT and END-USER SURVEY-PHASE 1 STUDY O				•
Data Type: Hero ID:	Acute (0-96 1928244	5 hour); Aquatic; Fish				
Domain		Metric	Rating†	MWF*	Score	${\rm Comments}^{\dagger\dagger}$
	Metric 18:	Consistency of Outcome Assessment	Low	× 1	3	See note '**' at the bottom of the table.
Domain 6: Confe	ounding / Vai	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	Low	$\times$ 2	6	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	Low	$\times 1$	3	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	Low	$\times 2$	6	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	Low	× 1	3	See note '**' at the bottom of the table.
Overall Quality	Determination	n <sup>‡</sup>	Łow —	→ Medium	2.7	The primary purpose for this study was to determine the potential of HBCD to bioconcentrate in fish. However, preliminary information about the toxicity is always reported with this type of test. Although limited information is available in the reporting document, supplementary informations on the acute toxicity endpoint has been reported.
Extracted			Yes			

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 27:\ Data\ Evaluation\ table\ for\ reference\ 1928244\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1928244).$ 

Study Citation:						H BIOCONCENTRATION TEST W/RAINBOW IE RETARDANT, W/ATTCHMTS and DATED
	8/28/00.	id END-USER SURVET-FITASE I STUDI O	r brow.	MALED	LLAM	ie retardant, w/attenmis and dated
Data Type:	Other; Aqu	atic: Fish				
Hero ID:	1928244	,				
Domain		Metric	Rating†	MWF*	Score	$Comments^{\dagger\dagger}$
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	)esign					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	ure Characte	erization				
	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Domain 4: Test C	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:						H BIOCONCENTRATION TEST W/RAINBOW IE RETARDANT, W/ATTCHMTS and DATED
Data Type:	Other; Aqu	atic; Fish				
Hero ID:	1928244					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${ m Comments}^{\dagger\dagger}$
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confe	ounding / Var	riable Control				
Domain o. Com	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note *** at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note *** at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note "**" at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality	Determination	<b>1</b>	High		1.0	
Extracted			Yes			

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 28: Data Evaluation table for reference 1928267 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1928267).

Study Citation:		). Determination of the acute toxicity of hexa	bromid S	to the	waterfle	a Daphnia magna straus with cover letter dated
	040590.					
Data Type:	,	6 hour); Aquatic; Invertebrates				
Hero ID:	1928267					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	$\operatorname{High}$	$\times$ 1	1	See note "**" at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain 6. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion			_	
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Low	× 1	3	Only nominal concentrations are reported
	Metric 10:	Exposure Duration and Frequency	nan	$\times 2$	6	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	only nominal concentrations were reported
Domain 4: Test C	)røanism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
		Group	O			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:	040590.	Basf,. 1990. Determination of the acute toxicity of hexabromid S to the waterflea Daphnia magna straus with cover letter dated 040590.  Acute (0-96 hour); Aquatic; Invertebrates							
Data Type: Hero ID:	1928267	nour); Aquatic; invertebrates							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 6: Confo	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note *** at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality Determination <sup>‡</sup>		High		1.2					
Extracted			Yes						

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 29: Data Evaluation table for reference 1928289 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/1928289).

Study Citation:						TO DYNAMAC CORP/USEPA SUBMITTING
D / M		HEXABROMOCYCLODODECANE AND BIS(	TRIBRO.	МОРНЕ	NOXY)	ETHANE W/ATTCHMTS, DATED 2/13/89.
Data Type: Hero ID:	1928289	5 hour); Aquatic; Fish				
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
Domain 1. Test i.	Metric 1:	Test Substance Identity	High	$\times 2$	2	
	Metric 2:	Test Substance Source	High	$\times 1$	1	
	Metric 3:	Test Substance Purity	Low	$\times$ 1	3	not reported
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	
	Metric 5:	Negative Control Response	$\operatorname{High}$	$\times 1$	1	
	Metric 6:	Randomized Allocation	High	× 1	1	
Domain 3: Expos	sure Characte	prization				
Domain 6. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	
	Medite 7.	tion	mgn	A 2	2	
	Metric 8:	Consistency of Exposure Administration	High	$\times 1$	1	
	Metric 9:	Measurement of Test Substance Concentration	Low	$\times$ 1	3	nominal
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	
	Metric 12:	Testing at or Below Solubility Limit	Low	$\times$ 1	3	nominal conc
Domain 4: Tt	Ongonian					
Domain 4: Test 0	Metric 13:	Test Openions Changetonistics	High	$\times 2$	2	
		Test Organism Characteristics	0			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	
Domain 5: Outco	ome Assessme	ent.				
23110111 0. 00100	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	
	Metric 18:	Consistency of Outcome Assessment	High	$\stackrel{\wedge}{\times} 1$	1	
			~			

Study Citation:		TIAL SUBMISSION: LETTER FROM GREA HEXABROMOCYCLODODECANE AND BIS(				O DYNAMAC CORP/USEPA SUBMITTING THANE W/ATTCHMTS, DATED 2/13/89.
Data Type: Hero ID:	Acute (0-96 1928289	5 hour); Aquatic; Fish				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 6: Confo	ounding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	
	Metric 22:	Reporting of Data	High	$\times 2$	2	
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	
Overall Quality I	Determination	n <sup>‡</sup>	High		1.3	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 30: Data Evaluation table for reference 2343684 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/2343684).

Study Citation:		i, D.,Shen, R.,Wang, X.,Shi, D 2014. Mechanis ryzias melastigma) embryos. Aquatic Toxicology			clodode	canes induced developmental toxicity in marine
Data Type: Hero ID:	Other; Aqu 2343684	0 , 0 1				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	)esign					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	ure Characte	erization				
Domain of Enpos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	tion Consistency of Exposure Administration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentra-	Medium	$\times$ 1	2	Nominal concentrations were reported for exposure
		tion				treatments, but daily renewals did occur, alleviating some concerns.
	Metric 10:	Exposure Duration and Frequency	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Nominal concentrations reported and most of the exposure concentrations are below water solubility of HBCD.
Domain 4: Test (	)roanism					
Domain T. 1000 (	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
		Continued on next page				

Study Citation:		, D.,Shen, R.,Wang, X.,Shi, D. 2014. Mechanicyzias melastigma) embryos. Aquatic Toxicolog			clodode	canes induced developmental toxicity in marine
Data Type: Hero ID:	Other; Aqu 2343684	, , , ,				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confe	ounding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	no unrelated outcomes were reported
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	Low	$\times$ 1	3	statistical methods were not reported but how comparisons were made for each endpoint are discussed
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality	Determination	<b>1</b>	High		1.2	
Extracted			Yes			

 $<sup>\</sup>star$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>&</sup>lt;sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 31: Data Evaluation table for reference 2343690 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/2343690).

Study Citation:	40.	Sun, H.,Zhu, H.,Ruan, Y.,Liu, F.,Liu, X. 2014. oalgae, Spirulina subsalsa and Scenedesmus obl				
Data Type: Hero ID:	Other; Aqu 2343690	9 , 1		G/		v
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Low	× 1	3	Purity not reported.
Domain 2: Test I	Design					
Dollitain 2. Tool I	Metric 4:	Negative Controls	Unacceptable		4	none reported
	Metric 5:	Negative Control Response	Unacceptable		4	no control results provided, except that there was no background HBCD
	Metric 6:	Randomized Allocation	Low	× 1	3	Exposure treatment group allocation was not reported.
Domain 3: Expos	uro Characto	nrization				
Domain o. Expo.	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
	Wicelie I.	tion	111511	^ 2	-	see hole the bottom of the teate.
	Metric 8:	Consistency of Exposure Administration	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note "** at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	$\times$ 1	2	Only one exposure concentration ( $2~\rm ng/mL)$ used for each stereoisomer, for both algal species.
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note '**' at the bottom of the table.
Domain 4: Test 0	Drogniem					
Domain 4. 1630 (	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\begin{array}{c} \times 2 \\ \times 1 \end{array}$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
		Continued on next page				

Study Citation:				Zhang, Y.,Sun, H.,Zhu, H.,Ruan, Y.,Liu, F.,Liu, X 2014. Accumulation of hexabromocyclododecane diastereomers and enantiomers n two microalgae, Spirulina subsalsa and Scenedesmus obliquus. Ecotoxicology and Environmental Safety 104:136-142							
Data Type: Hero ID:	Other; Aqua 2343690	atic; Plants									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>					
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.					
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.					
Domain 6: Confe	ounding / Var	riable Control									
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.					
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.					
Domain 7: Data	Presentation	and Analysis									
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.					
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.					
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.					
Overall Quality I	Determination	‡	Unacceptable		4.0						
Extracted			Yes								

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

<sup>\*\*\*</sup> Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 32: Data Evaluation table for reference 2343709 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/2343709).

Study Citation:	,	. M.,Lopez Parron, M.,Mergia, M. T.,Carolus, I	,			· · · · · · · · · · · · · · · · · · ·
<b>.</b>		ons of organic substances for early life developm	ent of egg- $\epsilon$	exposed f	ish. Ecc	ptoxicology and Environmental Safety 101:14-22
Data Type: Hero ID:	Chronic (> 2343709	21 days); Aquatic; Fish				
nero iD:	2343109					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	Survival were higher that the experimental groups.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domestic Street	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentra-	High	× 1	1	See note '**' at the bottom of the table.
		tion	0			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	Used DMSO as a solvent
Domain 4: Test C	Organism					
	Metric 13:	Test Organism Characteristics	Medium	$\times 2$	4	Not on the list of recommended species.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:  Data Type: Hero ID:	concentration					k, C.,Dao, Q.,Murk, A. J 2014. Internal effect otoxicology and Environmental Safety 101:14-22
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 6: Confo	ounding / Var	iable Control				
	Metric 19:	Confounding Variables in Test Design and	$\operatorname{High}$	$\times \ 2$	2	See note '**' at the bottom of the table.
		Procedures				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	imes 2	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality I	Determination	<b>,</b> ‡	High		1.1	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table \ 33: \ Data \ Evaluation \ table \ for \ reference \ 2343723 \ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/2343723).$ 

Study Citation:	400					netabolization and isomerization of hexabromocy-
Data Type: Hero ID:		e (HBCD) diastereomers in mirror carp from wa 21 days); Aquatic; Fish	iter. Jour	nal of Ha	azardou	s Materials 264
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentra- tion	High	× 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	not addressed
Domain 4: Test (	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:		Sun, H.,Ruan, Y 2014. Enantiomer-specific accee (HBCD) diastereomers in mirror carp from wa				netabolization and isomerization of hexabromocys s Materials 264
Data Type: Hero ID:	Chronic (> 2343723	21 days); Aquatic; Fish				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 6: Confo	ounding / Vai	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality I	Determination	$n^{\ddagger}$	High		1.1	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 34: Data Evaluation table for reference 2528343 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/2528343).

Study Citation:	0, ,	Pan, L., Tao, Y 2014. Antioxidant responses in elecane. Environmental Science and Pollution Re				m exposed to environmental pollutant hexabro-
Data Type: Hero ID:		atic; Sediment-dwelling	esearch 21.6	3200-3210	,	
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Low	× 1	3	substance purity not reported
Domain 2: Test I	Design					
150110111 21 1000 1	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	× 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	Low	× 1	3	There was no report on how organisms were allocated to study groups.
Domain 2. Evra	ouna Chanasta	nigotion.				
Domain 3: Expos	sure Cnaracie Metric 7:	Experimental System/Test Media Prepara-	Low	$\times$ 2	6	
	Metric 1:	tion tion	Low	× 2	b	exposure system and water quality details/ conditions were not reported
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	nominal concentrations reported
	Metric 10:	Exposure Duration and Frequency	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Two exposure concentrations above water solubility
Domain 4: Test (	Organism					
Domain 4. 1est (	Metric 13:	Test Organism Characteristics	Low	$\times \ 2$	6	Clams are an appropriate test organism for sedi-
	Medite 10.	Test Organism Characteristics	Low	^ 2	Ü	ment/legacy contaminants, but there is a deficiency in organism age/characteristics.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	Medium	× 1	2	Some uncertainties about diet/water conditions during the exposure since information was provided for the acclimation period.

Study Citation:	Zhang, H.,Pan, L.,Tao, Y 2014. Antioxidant responses in clam Venerupis philippinarum exposed to environmental pollutant hexabro-mocyclododecane. Environmental Science and Pollution Research 21:8206-8215							
Data Type:		atic; Sediment-dwelling						
Hero ID:	2528343	,						
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$		
Domain 5: Outco	ome Assessme	nt						
	Metric 17:	Outcome Assessment Methodology	High	$\times \ 2$	2	See note '**' at the bottom of the table.		
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.		
Domain 6: Confo	unding / Var	iable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.		
	Metric 20:	Outcomes Unrelated to Exposure	Medium	$\times$ 1	2	no unrelated outcomes were reported		
Domain 7: Data	Presentation	and Analysis						
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.		
Overall Quality I	Determination	<b>*</b>	High		1.5			
Extracted			Yes					

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

 $<sup>^{\</sup>dagger\dagger}$  Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table~35:~Data~Evaluation~table~for~reference~2965902~(https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/2965902).$ 

·	Shi, Y. J., Xu, X. B., Zheng, X. Q., Lu, Y. L. 2015. Responses of growth inhibition and antioxidant gene expression in earthworms (Eisenia fetida) exposed to tetrabromobisphenol A, hexabromocyclododecane and decabromodiphenyl ether. Comparative Biochemistry and Physiology - Part C: Toxicology and Pharmacology								
Data Type:		estrial; Invertebrate							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$			
Domain 1: Test Su	ıbstance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.			
Domain 2: Test De	esign								
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 6:	Randomized Allocation	Medium	× 1	2	Samples were randomly selected for destructive sampling at different time points, but it was not mentioned whether organisms were randomly allocated to treatment groups.			
Domain 3: Exposu	ire Characte	erization							
_	Metric 7:	Experimental System/Test Media Preparation	Medium	$\times$ 2	4	No report on soil renewals (likely only dosed once at the beginning), and there were not measured data on soil HBCD concentrations following various sam- pling time points.			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	Only nominal concentrations are reported.			
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	soil exposure			
Domain 4: Test O	rganism								
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.			
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.			
		Continued on next page							

Study Citation:	Shi, Y. J.,Xu, X. B.,Zheng, X. Q.,Lu, Y. L 2015. Responses of growth inhibition and antioxidant gene expression in earthworms (Eisenia fetida) exposed to tetrabromobisphenol A, hexabromocyclododecane and decabromodiphenyl ether. Comparative Biochemistry and Physiology - Part C: Toxicology and Pharmacology								
Data Type: Hero ID:	v	estrial; Invertebrate							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
	Metric 16:	Adequacy of Test Conditions	Low	× 1	3	Limited details available on feeding, and conditions of the exposure, but authors cited OECD 1984 for cultivation (not experiment protocol).			
Domain 5: Outco	ome Assessme	$\operatorname{ent}$							
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	all reported			
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.			
Domain 6: Confo	ounding / Var	iable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality I	Determination	<b>,</b>	High		1.2				
Extracted			Yes						

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 36: Data Evaluation table for reference 3350472 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3350472).

Study Citation:	, ,		phytotoxi	city of t	echnical	hexabromocyclododecane in maize. Journal of
		ntal Sciences 42:97-104				
Data Type:	,	hour); Terrestrial; other Plant				
Hero ID:	3350472					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note *** at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain of Enpos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion	O			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Low	$\times$ 1	3	Nominal daily renewal
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	not addressed; nominal daily renewal
Domain 4: Test 0	Droanism					
Domain 4. 1030 (	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
		Group	0	, , <u>.</u>	-	at the sevent of the tubic.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note *** at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:	Wu, T., Huang, H., Zhang, S 2016. Accumulation and phytotoxicity of technical hexabromocyclododecane in maize. Journal of Environmental Sciences 42:97-104									
Data Type: Hero ID:	Acute (0-96 hour); Terrestrial; other Plant 3350472									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>				
Domain 6: Confo	ounding / Var	riable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality Determination <sup>‡</sup>		High		1.2						
Extracted			Yes							

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 37: Data Evaluation table for reference 3350492 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3350492).

Study Citation:		· · · · · · · · · · · · · · · · · · ·				on, and Isomerization of Hexabromocyclododecane
		omers by Wheat in Closed Chambers. Environn	nental Sci	ence and	Techno	blogy 50:2652-2659
Data Type:		restrial; other Plant				
Hero ID:	3350492					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain 6. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion		· · ·	_	
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note "**" at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 4: Test 0	Droanism					
Domain 4. 16st C	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times 1$	1	See note *** at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
	1.100110 101	Group	****	· · · ·	-	200 Hotel de the bottom of the tuble.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note "**" at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note "**" at the bottom of the table.
		Continued on next page				

Study Citation:		n, H., Zhang, Y., Xu, J., Li, B., Zhou, Q. 2016. Upomers by Wheat in Closed Chambers. Environn				on, and Isomerization of Hexabromocyclododecane
Data Type:		estrial; other Plant				0.
Hero ID:	3350492					
Domain		$\operatorname{Metric}$	Rating†	MWF*	Score	Comments <sup>††</sup>
D 2 C C C	15 / 37					
Domain 6: Confe	0 /		TT: 1	0	0	
	Metric 19:	Confounding Variables in Test Design and	High	$\times 2$	2	See note '**' at the bottom of the table.
		Procedures				
	Metric 20:	Outcomes Unrelated to Exposure	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note *** at the bottom of the table.
Overall Quality I	Overall Quality Determination <sup>‡</sup>		High		1.0	
Extracted			Yes			
	Determination	n <sup>‡</sup>	High Yes		1.0	

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 38: Data Evaluation table for reference 3350507 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3350507).

Study Citation:	0, ,	hen, R.,Liu, W.,Li, D.,Huang, L.,Shi, D 2015. of the marine medaka Oryzias melastigma. Mar				v
Data Type: Hero ID:	Other; Aqu 3350507	· ·	inic i onuti	on Dance		
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	ure Characte	erization				
Domain o. Expos	Metric 7:	Experimental System/Test Media Preparation	Medium	$\times$ 2	4	No mentioning of whether the testing media re- newals accounted for maintaining HBCD exposure concentration consistency.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	$\operatorname{High}$	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	All HBCD concentrations are above water solubility (except for the control).
Domain 4: Test C	Organism					
	Metric 13:	Test Organism Characteristics	Medium	$\times$ 2	4	Source not revealed, although it is assumed by "collected daily" that there is a lab culture.
	Metric 14:	Acclimitization and Pretreatment Conditions	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
		Continued on next page				

Study Citation:	Hong, H.,Shen, R.,Liu, W.,Li, D.,Huang, L.,Shi, D. 2015. Developmental toxicity of three hexabromocyclododecane diastereoisomers in embryos of the marine medaka Oryzias melastigma. Marine Pollution Bulletin 101:110-118 Other; Aquatic; Fish 3350507								
Data Type: Hero ID:									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.			
Domain 6: Confo	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality I	Determination	ı <sup>‡</sup>	High		1.2				
Extracted			Yes						

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table \ 39: \ Data \ Evaluation \ table \ for \ reference \ 3350510 \ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3350510).$ 

Study Citation:	and metabo	T.,Sun, H.,Zhang, Y.,Yang, J. 2016. Diastere olism of hexabromocyclododecanes (HBCDs) int 542:427-434				
Data Type: Hero ID:		21 days); Terrestrial; Invertebrate				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	$_{ m Comments}$
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	Medium	$\times$ 2	4	The percentage of each isomer was not mentioned, only the source and previous work has characterized the percentage of each isomer.
	Metric 2:	Test Substance Source	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 2: Test l	0					
	Metric 4:	Negative Controls	Medium	$\times$ 2	4	Uncertainty regarding the control clean sediment, specifically if the same carrier solvent used in the HBCD treatments was used in the clean soil used for the control.
	Metric 5:	Negative Control Response	Unacceptable		4	biological responses were not reported
	Metric 6:	Randomized Allocation	Low	× 1	3	Allocation method not reported
Domain 3: Expos	anna Charact	ovization				
Domain 5. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
	Medile 1.	tion	mgn	^ 2	2	see note at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note *** at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	Medium	× 1	2	Only one exposure concentration per HBCD isomer was used, but the purpose of the study is to evaluate HBCD uptake and depuration. However different numbers of each type of earthworm were used.
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	soil exposure
Domain 4: The 1	O					
Domain 4: Test	Organism Metric 13:	Test Organism Characteristics	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 13:	Acclimitization and Pretreatment Conditions	rugn High	$\begin{array}{c} \times \ 2 \\ \times \ 1 \end{array}$	1	See note '**' at the bottom of the table.  See note '**' at the bottom of the table.
	WICHIO 14.		111811		т	bee note — at the bottom of the table.
		Continued on next page				

Study Citation:	and metabo	T.,Sun, H.,Zhang, Y.,Yang, J 2016. Diastere blism of hexabromocyclododecanes (HBCDs) int 542:427-434		_		· · · · · · · · · · · · · · · · · · ·
Data Type: Hero ID:	Chronic (>: 3350510	21 days); Terrestrial; Invertebrate				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 15:	Number of Organisms and Replicates per Group	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	та Ассосста					
Domain 5. Outee	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confo	unding / Var	siable Central				
Domain 6. Como	Metric 19:	Confounding Variables in Test Design and Procedures	Medium	$\times$ 2	4	No explanation for different number of organisms used.
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	no data on health outcomes were reported
Domain 7: Data	Procentation	and Analysis				
Domain 1. Data	Metric 21:	Statistical Methods	High	× 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times \overset{\sim}{2}$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality Determination <sup>‡</sup>		$ \begin{array}{c} \text{Unacceptable} \longrightarrow \text{Low} \end{array} $		4.0	Although biological responses weren't reported for the earthworms, nor was it reported whether a sol- vent was used in the negative control, this study doesn't necessarily mean it didn't capture it. The goal of the study wasn't to look at toxicity necessar- ily, but uptake and depuration.	
Extracted			Yes			
		Continued on next page				

Study Citation: Li, B., Yao, T., Sun, H., Zhang, Y., Yang, J. 2016. Diastereomer- and enantiomer-specific accumulation, depuration, bioisomerization,

and metabolism of hexabromocyclododecanes (HBCDs) in two ecologically different species of earthworms. Science of the Total

Environment 542:427-434

Data Type: Chronic (>21 days); Terrestrial; Invertebrate

Hero ID: 3350510

Domain Metric Rating<sup>†</sup>  $MWF^*$  Score Comments<sup>††</sup>

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.$$

where High= $\geq 1$  to < 1.7; Medium = $\geq 1.7$  to < 2.4; Low = $\geq 2.4$  to < 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

<sup>\*</sup> MWF = Metric Weighting Factor

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

Table 40: Data Evaluation table for reference 3350537 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3350537).

Study Citation:					~	c effects of hexabromocyclododecanes on hepatic
		arbon receptors and cytochrome P450s in zebra	fish (Dan	io rerio).	Chemo	osphere 132:24-31
Data Type:	,	21 days); Aquatic; Fish				
Hero ID:	3350537					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note "**" at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
Domain 2. Test I	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	× 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	uro Characte	nization				
Domain 5. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
	Medic 1.	tion	111511	^ 2	2	see note at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 4: Test 0	Drogniem					
Domain 4. Test C	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
	1,120110 101	Group	11.0	, , <u>-</u>	-	at the settem of the tubic.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:		g, C.,Qiu, L.,Dong, S.,Zhang, X.,Yan, C. 2018 arbon receptors and cytochrome P450s in zebra			_	c effects of hexabromocyclododecanes on hepatic sphere 132:24-31
Data Type:	•	21 days); Aquatic; Fish	•	,		
Hero ID:	3350537					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 6: Confo	unding / Var	iable Control				
Bomain o. Como	Metric 19:	Confounding Variables in Test Design and	High	$\times 2$	2	See note '**' at the bottom of the table.
		Procedures	0		_	
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality I	Determination	n <sup>‡</sup>	High		1.0	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 41: Data Evaluation table for reference 3546057 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3546057).

Study Citation:	, , , ,					elopmental toxicity of hexabromocyclododecanes
	,	n the marine copepod Tigriopus japonicus. Che	emosphere	167:155	-162	
Data Type:		atic; Invertebrates				
Hero ID:	3546057					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note *** at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	ure Characte	erization				
Domain o. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion				
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	High	$\times$ 1	1	See note "**" at the bottom of the table.
Domain 4: Test C	raaniem					
Domain 4. 1est C	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
	MICHIE 10.	Group	111811	/\ I	1	at the bottom of the table.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note "**" at the bottom of the table.
		Continued on next page				

Study Citation:	(HBCDs) on the marine copepod Tigriopus japonicus. Chemosphere 167:155-162									
Data Type: Hero ID:	Other; Aqu. 3546057	atic; Invertebrates								
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>				
Domain 6: Confo	ounding / Var	riable Control								
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times 2$	2	See note *** at the bottom of the table.				
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.				
Domain 7: Data	Presentation	and Analysis								
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.				
Overall Quality I	Determination	n <sup>‡</sup>	High		1.0					
Extracted			Yes							

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 42: Data Evaluation table for reference 3586421 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3586421).

Study Citation:		1997. Hexabromocyclododecane (HBCD): A 4	48-Hour Flo	w-Throu	gh Acu	te Toxicity Test with the Cladoceran (Daphni
Data Type: Hero ID:		h Cover Letter Dated 06/20/1997. hour); Aquatic; Invertebrates				
Domain		Metric	Rating†	MWF*	Score	$Comments^{\dagger\dagger}$
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	× 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Medium	× 1	2	Unsure of what the impurities are among the three samples that were submitted. The HBCD used in the experiment is a composite of samples from three different manufacturers:.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
_	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	$\operatorname{High}$	$\times 1$	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note *** at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	The selection of HBCD exposure concentrations higher than the water solubility is explained (solubility enhanced by the use of carrier solvent), but the test parameters were explained so that it is likely that the exposure concentrations were consistent throughout the experiment and the test organisms were healthy in all the control treatments.
Domain 4: Test 0	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.

Study Citation:		1997. Hexabromocyclododecane (HBCD): A 4	18-Hour Flo	w-Throu	gh Acu	te Toxicity Test with the Cladoceran (Daphnia
Data Type: Hero ID:	- ,	h Cover Letter Dated 06/20/1997. hour); Aquatic; Invertebrates				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Only two reps per treatment group.
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confo	ounding / Vai	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	Medium	$\times$ 2	4	Study reported minor differences among the treatment groups in regards to HBCD concentrations.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
Dollari II Data	Metric 21:	Statistical Methods	Low	$\times$ 1	3	No statistical methods were outlined.
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	Medium	× 1	2	The death in one treatment group was not explained, but was reported, and the differences in HBCD concentrations in a few of the treatment groups were explained.
Overall Quality I	Determination	n <sup>‡</sup>	High		1.3	
Extracted			Yes			
		Continued on next page				

Study Citation: Ltd, W. I.. 1997. Hexabromocyclododecane (HBCD): A 48-Hour Flow-Through Acute Toxicity Test with the Cladoceran (Daphnia

magna) with Cover Letter Dated 06/20/1997.

Data Type: Acute (0-96 hour); Aquatic; Invertebrates

Hero ID: 3586421

Domain Metric Rating<sup>†</sup> MWF\* Score Comments<sup>††</sup>

 $^{\star}$  MWF = Metric Weighting Factor

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

where High= $\geq 1$  to < 1.7; Medium = $\geq 1.7$  to < 2.4; Low = $\geq 2.4$  to < 3. If the reviewer determines that the overall rating needs adjustment, the original rating is crossed out and an arrow points to the new rating.

†† Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 43: Data Evaluation table for reference 3586422 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3586422).

Study Citation:		1997. Letter from Chem Mfgs Assoc to US th Attachments, Dated 06/27/1997.	EPA Rega	rding: T	oxicolog	gical Investigation of Hexabromocyclododecane
Data Type: Hero ID:		5 hour); Aquatic; Fish				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Medium	× 1	2	Unsure of what the impurities are in the HBCD exposure.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	ure Characte	erization				
	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**' at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Some concentrations were above HBCD's water solubility, but all exposure concentrations were measured.
Domain 4: Test (	Organism					
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Metric 13:	Test Organism Characteristics	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Only two true replicates per treatment group.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	me Assessme	ent				
		Continued on next page				

Study Citation:		1997. Letter from Chem Mfgs Assoc to US th Attachments, Dated 06/27/1997.	SEPA Rega	rding: T	oxicolog	cical Investigation of Hexabromocyclododecane
Data Type: Hero ID:	,	hour); Aquatic; Fish				
Tiero ib.	3330422					
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 6: Confe	ounding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	Medium	$\times$ 2	4	Some uncertainty with the HBCD concentrations in the exposure treatment groups. Mentioning of co- eluting artifacts.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	Low	$\times$ 1	3	Statistical methods are unclear.
	Metric 22:	Reporting of Data	$_{ m High}$	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality l	Determination	n <sup>‡</sup>	High		1.2	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 44:\ Data\ Evaluation\ table\ for\ reference\ 3586422\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3586422).$ 

v	,	9	EPA Regai	rding: T	oxicolog	ical Investigation of Hexabromocyclododecane
Data Type:	,	th Attachments, Dated 06/27/1997. hour); Aquatic; Plants				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test Su	hetaneo					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	× 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Medium	× 1	2	Uncertainty with impurities present .
Domain 2: Test Do	acion					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	× 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Exposu	ıro Characto	wization				
-	ne Characte Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 1.	tion	IIIgii	A 2	2	see note at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1	See note '**, at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**, at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	Some exposure concentrations are above water solubility limits.
Domain 4: Test O	rganiem					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\stackrel{\wedge}{\times} \stackrel{Z}{1}$	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	Low	× 1	3	Uncertainty with number of replicates used per exposure concentration.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outcom	ne Assessme	ent.				
	me Assessme Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.

Study Citation:		1997. Letter from Chem Mfgs Assoc to US th Attachments, Dated 06/27/1997.	EPA Rega	rding: T	oxicolog	gical Investigation of Hexabromocyclododecane
Data Type:	,	hour); Aquatic; Plants				
Hero ID:	3586422	,, ,				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
***************************************	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
Domain 6: Confo	ounding / Var	iable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times \ 2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality I	Determination	,‡	High	***************************************	1.1	
Extracted			Yes			

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 45:\ Data\ Evaluation\ table\ for\ reference\ 3586425\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3586425).$ 

Study Citation:						timulated insulin-like growth factor-1 expression
		trout (Oncorhynchus mykiss) hepatocytes is me	diated by H	ERK, PI3	K-AKT	T, and JAK-STAT. 301:R236-R243
Data Type:	`	hour); Aquatic; Fish				
Hero ID:	3586425					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain of Enpos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion				
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	nominal in vitro cell exposure
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	nominal in vitro cell exposure
Domain 4: Test (	Organism					
23110111 1. 1000	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	× 1	1	See note '**' at the bottom of the table.
		Group	J			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:  Data Type: Hero ID:	in rainbow	Reindl, K. M., Kittilson, J. D., Bergan, H. E., Sheridan, M. A 2011. Growth hormone-stimulated insulin-like growth factor-1 expression in rainbow trout (Oncorhynchus mykiss) hepatocytes is mediated by ERK, PI3K-AKT, and JAK-STAT. 301:R236-R243 Acute (0-96 hour); Aquatic; Fish 3586425							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 6: Confo	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality Determination <sup>‡</sup>			High		1.1				
Extracted			Yes						

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

<sup>\*\*</sup>Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 46:\ Data\ Evaluation\ table\ for\ reference\ 3586533\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3586533).$ 

Study Citation:	,	1998. Initial Submission: Hexabromocyclododd		,	Flow-Th	rough Life-Cycle Toxicity Test with the Clado
Data Type: Hero ID:		hnia magna), Final Report, with Cover Letter I 21 days); Aquatic; Invertebrates	Dated 5/18 <sub>/</sub>	'1998.		
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	Medium	× 1	2	Unsure of what the impurities are in the HBCD mixture used in exposures. $$
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain of Bright	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note *** at the bottom of the table.
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note *** at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Medium	× 1	2	There are exposure concentrations above the water solubility of HBCD.
Domain 4: Test 0	Organism					
	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Only two replicates per treatment group.
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
		Continued on next page				

Study Citation:	Ltd, W. I 1998. Initial Submission: Hexabromocyclododecane (HBCD) - A Flow-Through Life-Cycle Toxicity Test with the Cladoceran (Daphnia magna), Final Report, with Cover Letter Dated 5/18/1998.								
Data Type: Hero ID:		21 days); Aquatic; Invertebrates	, , , , , , , , , , , , , , , , , , , ,	1000.					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.			
Domain 6: Confo	ounding / Var	iable Control							
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.			
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality I	Determination	<b>,</b> ‡	High		1.1				
Extracted			Yes						

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 47: Data Evaluation table for reference 3586733 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3586733).

Study Citation:		· ·	17 to the	Bluegill	Sunfish	Lepomis macrochirus rafinesque with Test Data
	and Cover l					
Data Type:	,	hour); Aquatic; Fish				
Hero ID:	3586733					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note "**" at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Bomam o. Expo	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion	8			
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Low	$\times$ 1	3	nominal
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note *** at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	$\times$ 1	3	nominal, precipitate present
Domain 4: Test (	Organism					
25mam 1. 1050 (	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	$\times$ 1	1	See note '**' at the bottom of the table.
		Group	0			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note *** at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:	Corp, U. C., 1990. The Acute Toxicity of HBCD Lot 990-17 to the Bluegill Sunfish Lepomis macrochirus rafinesque with Test Data and Cover Letter.							
Data Type: Hero ID:	Acute (0-96 3586733	5 hour); Aquatic; Fish						
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>		
Domain 6: Confo	ounding / Var	riable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.		
	Metric 20:	Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.		
Domain 7: Data	Presentation	and Analysis						
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.		
Overall Quality Determination <sup>‡</sup>		High		1.2				
Extracted			Yes					

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table~48:~Data~Evaluation~table~for~reference~3618094~(https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3618094).$ 

Data Type: Hero ID:	Lower, N 2008. The Effects of Contaminants on Various Life-Cycle Stages of Atlantic Salmon (Salmo salar L.). Chronic (>21 days); Aquatic; Fish 3618094									
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	${\rm Comments}^{\dagger\dagger}$				
Domain 1: Test S	ubstance									
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.				
Domain 2: Test D	Design									
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 6:	Randomized Allocation	High	$\times$ 1	1	See note '**' at the bottom of the table.				
Domain 3: Expos	ure Characte	erization								
1. 2.1 <b>.</b>	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.				
	Metric 8:	Consistency of Exposure Administration	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 9:	Measurement of Test Substance Concentration	High	$\times$ 1	1	See note '**' at the bottom of the table.				
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.				
	Metric 12:	Testing at or Below Solubility Limit	High	× 1	1	See note "** at the bottom of the table.				
Domain 4: Test C	)rganism									
2 0 11 10 10 0	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.				
	Metric 15:	Number of Organisms and Replicates per Group	High	× 1	1	See note '**' at the bottom of the table.				
	Metric 16:	Adequacy of Test Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.				
Domain 5: Outco	me Assessme	ent.								
2 3 main 5. Out00.	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.				
		Continued on next page								

Study Citation: Data Type: Hero ID:								
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>		
Domain 6: Confe	ounding / Var	riable Control						
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	See note '**' at the bottom of the table.		
	Metric 20:	Outcomes Unrelated to Exposure	High	$\times$ 1	1	See note '**' at the bottom of the table.		
Domain 7: Data	Presentation	and Analysis						
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 22:	Reporting of Data	High	$\times 2$	2	See note '**' at the bottom of the table.		
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.		
Overall Quality	Overall Quality Determination <sup>‡</sup>		High		1.0			
Extracted			Yes					

<sup>\*</sup> MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} \end{array} \right. \\ \text{(round to the nearest tenth) otherwise} \quad , \\ \\ \end{array}$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

 $<sup>^{\</sup>dagger\dagger}$  Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 2]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

Table 49: Data Evaluation table for reference 3619397 (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3619397).

Study Citation:		. 2006. Novel In Vitro, Ex Vivo and In Vivo A	ssays Eluci	dating th	e Effect	ts of Endocrine Disrupting Compounds (EDCs
Data Type: Hero ID:		Hormone Action. atic; other frog				
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expo	sure Characte	erization				
Dominion Empe	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentra- tion	Low	× 1	3	nominal conc
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	Low	× 1	3	not addressed; nominal conc
Domain 4: Test	Organism					
20110111 11 1000	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per Group	Medium	× 1	2	Number of organisms reported but not replicates
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:  Data Type: Hero ID:	Schriks, M 2006. Novel In Vitro, Ex Vivo and In Vivo Assays Elucidating the Effects of Endocrine Disrupting Compounds (EDCs) on Thyroid Hormone Action.  Other; Aquatic; other frog 3619397							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>		
Domain 6: Confo	ounding / Va Metric 19:	Confounding Variables in Test Design and	High	× 2	2	See note '**' at the bottom of the table.		
	Metric 20:	Procedures Outcomes Unrelated to Exposure	High	× 1	1	See note '**' at the bottom of the table.		
Domain 7: Data	Presentation	and Analysis						
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.		
	Metric 22:	Reporting of Data	High	$\times \ 2$	2	See note '**' at the bottom of the table.		
	Metric 23:	Explanation of Unexpected Outcomes	High	$\times$ 1	1	See note '**' at the bottom of the table.		
Overall Quality Determination <sup>‡</sup>		High		1.2				
Extracted			Yes					

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 50:\ Data\ Evaluation\ table\ for\ reference\ 3809143\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/3809143).$ 

Study Citation:	M. Oetken, K. Ludwichowski, R. Nagel. 2001. Validation of the preliminary EU-concept of assessing the impact of chemicals to organisms in sediment by using selected substances.								
Data Type:		21 days); Aquatic; Sediment-dwelling							
Hero ID:	3809143								
Domain		$\operatorname{Metric}$	Rating <sup>†</sup>	MWF*	Score	$\mathrm{Comments}^{\dagger\dagger}$			
Domain 1: Test S	Substance								
	Metric 1:	Test Substance Identity	High	$\times 2$	2				
	Metric 2:	Test Substance Source	Low	$\times$ 1	3	not reported			
	Metric 3:	Test Substance Purity	Low	× 1	3	not reported			
Domain 2: Test l	Design								
	Metric 4:	Negative Controls	High	$\times 2$	2				
	Metric 5:	Negative Control Response	High	$\times$ 1	1				
	Metric 6:	Randomized Allocation	High	× 1	1				
Domain 3: Expo	sure Characte	erization							
1	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2				
	Metric 8:	Consistency of Exposure Administration	High	$\times 1$	1				
	Metric 9:	Measurement of Test Substance Concentration	High	× 1	1				
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2				
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	$\times$ 1	1				
	Metric 12:	Testing at or Below Solubility Limit		N/A	sediment exposure				
Domain 4: Test	Organism								
Domain 4. Test	Metric 13:	Test Organism Characteristics	High	$\times 2$	2				
	Metric 14:	Acclimitization and Pretreatment Conditions	Low	$\times 1$	3	not reported			
	Metric 15:	Number of Organisms and Replicates per	Low	$\times$ 1	3	Number of replicates per concentration was not re			
		Group				ported			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1				
Domain 5: Outco	ome Assessme	ent.							
_ 311311 3. 3400	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2				
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1				
		Continued on next page							

Study Citation:		K. Ludwichowski, R. Nagel. 2001. Validation sediment by using selected substances.	n of the p	reliminary 1	EU-concept o	f assessing the impact of chemicals to
Data Type: Hero ID:	Chronic (>2 3809143	21 days); Aquatic; Sediment-dwelling				
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>
Domain 6: Confe	ounding / Var	riable Control				
	Metric 19:	Confounding Variables in Test Design and Procedures	High	$\times$ 2	2	
	Metric 20:	Outcomes Unrelated to Exposure	Low	× 1	3	not reported
Domain 7: Data	Presentation	and Analysis				
	Metric 21:	Statistical Methods	High	$\times$ 1	1	
	Metric 22:	Reporting of Data	$_{ m High}$	$\times 2$	2	
	Metric 23:	Explanation of Unexpected Outcomes	Medium	× 1	2	Unexpected outcomes such as control organisms taking longer to emerge than organisms exposed to HBCD were not explained.
Overall Quality l	Determination	,‡	High		1.4	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left[ \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right]_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (c) Low: Deficiencies or concerns are noted in the domain metric that are likely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 51:\ Data\ Evaluation\ table\ for\ reference\ 4269889\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/4269889).$ 

Study Citation:		Hexabromocyclododecane (HBCD): A Prolong	ed Sedimen	t Toxicity	y Test w	vith Hyalella azteca Using Spiked Sediment with
D-4- T		otal Organic Carbon. 21 days); Aquatic; Sediment-dwelling				
Data Type: Hero ID:	4269889	21 days); Aquatic; Sediment-dwelling				
Domain		Metric	Rating†	MWF*	Score	Comments <sup>††</sup>
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test I	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Domain o. Expos	Metric 7:	Experimental System/Test Media Preparation	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	only the control, lowest and highest exposure concentrations were measured
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	sediment exposure
Domain 4: Test (	Iraaniem					
Domain 4. Test C	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	× 1	1	See note '**' at the bottom of the table.
		Group				
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times$ 2	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:		ACC. 2003. Hexabromocyclododecane (HBCD): A Prolonged Sediment Toxicity Test with Hyalella azteca Using Spiked Sediment with 2 percent Total Organic Carbon.							
Data Type: Hero ID:	Chronic (>: 4269889	21 days); Aquatic; Sediment-dwelling							
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>			
Domain 6: Confo	ounding / Var	riable Control							
	Metric 19:	Confounding Variables in Test Design and	High	$\times 2$	2	See note '**' at the bottom of the table.			
		Procedures							
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	not reported			
Domain 7: Data	Presentation	and Analysis							
	Metric 21:	Statistical Methods	$\operatorname{High}$	$\times$ 1	1	See note '**' at the bottom of the table.			
	Metric 22:	Reporting of Data	High	$\times \ 2$	2	See note '**' at the bottom of the table.			
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.			
Overall Quality I	Overall Quality Determination <sup>‡</sup>				1.1				
Extracted			Yes						

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rceil_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

<sup>\*\*</sup>Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].

 $Table\ 52:\ Data\ Evaluation\ table\ for\ reference\ 4269912\ (https://heronet.epa.gov/heronet/index.cfm/reference/download/reference\_id/4269912).$ 

Study Citation:		- · · · · · · · · · · · · · · · · · · ·	ed Sedimen	t Toxicit;	y Test w	vith Hyalella azteca Using Spiked Sediment with
	-	otal Organic Carbon.				
Data Type: Hero ID:	Chronic (> 4269912	21 days); Aquatic; Sediment-dwelling				
		Metric	Rating <sup>†</sup>	MWF*	Casas	Comments <sup>††</sup>
Domain ———		Metric	rating,	IVI VV F	Score	Comments
Domain 1: Test S	Substance					
	Metric 1:	Test Substance Identity	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 2:	Test Substance Source	High	$\times$ 1	1	See note '**' at the bottom of the table.
***************************************	Metric 3:	Test Substance Purity	High	× 1	1	See note '**' at the bottom of the table.
Domain 2: Test l	Design					
	Metric 4:	Negative Controls	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 5:	Negative Control Response	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 6:	Randomized Allocation	High	× 1	1	See note '**' at the bottom of the table.
Domain 3: Expos	sure Characte	erization				
Bontam o. Expos	Metric 7:	Experimental System/Test Media Prepara-	High	$\times 2$	2	See note '**' at the bottom of the table.
		tion				
	Metric 8:	Consistency of Exposure Administration	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 9:	Measurement of Test Substance Concentration	Medium	× 1	2	only the control, lowest and highest exposure concentration was measured $$
	Metric 10:	Exposure Duration and Frequency	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 11:	Number of Exposure Groups/Spacing of Exposure Levels	High	× 1	1	See note '**' at the bottom of the table.
	Metric 12:	Testing at or Below Solubility Limit	N/A		N/A	sediment exposure
Domain 4: Test	Organism					
Domain I. Tost	Metric 13:	Test Organism Characteristics	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 14:	Acclimitization and Pretreatment Conditions	High	× 1	1	See note '**' at the bottom of the table.
	Metric 15:	Number of Organisms and Replicates per	High	× 1	1	See note '**' at the bottom of the table.
		Group	0			
	Metric 16:	Adequacy of Test Conditions	High	× 1	1	See note '**' at the bottom of the table.
Domain 5: Outco	ome Assessme	ent				
	Metric 17:	Outcome Assessment Methodology	High	$\times 2$	2	See note '**' at the bottom of the table.
	Metric 18:	Consistency of Outcome Assessment	High	× 1	1	See note '**' at the bottom of the table.
		Continued on next page				

Study Citation:  Data Type: Hero ID:	ACC. 2003. Hexabromocyclododecane (HBCD): A Prolonged Sediment Toxicity Test with Hyalella azteca Using Spiked Sediment with 5 percent Total Organic Carbon. Chronic (>21 days); Aquatic; Sediment-dwelling 4269912					
Domain		Metric	Rating <sup>†</sup>	MWF*	Score	Comments <sup>††</sup>
Domain 6: Confounding / Variable Control						
	Metric 19:	Confounding Variables in Test Design and	High	imes 2	2	See note '**' at the bottom of the table.
		Procedures				
	Metric 20:	Outcomes Unrelated to Exposure	Medium	× 1	2	not reported
Domain 7: Data Presentation and Analysis						
	Metric 21:	Statistical Methods	High	$\times$ 1	1	See note '**' at the bottom of the table.
	Metric 22:	Reporting of Data	High	$\times~2$	2	See note '**' at the bottom of the table.
	Metric 23:	Explanation of Unexpected Outcomes	High	× 1	1	See note '**' at the bottom of the table.
Overall Quality Determination <sup>‡</sup>			High		1.1	
Extracted			Yes			

 $<sup>^{\</sup>star}$  MWF = Metric Weighting Factor

$$\text{Overall rating} = \left\{ \begin{array}{ll} 4 & \text{if any metric is Unacceptable} \\ \\ \left\lfloor \sum_{i} \left( \text{Metric Score}_{i} \times \text{MWF}_{i} \right) / \sum_{j} \text{MWF}_{j} \right\rfloor_{0.1} & \text{(round to the nearest tenth) otherwise} \end{array} \right.,$$

<sup>†</sup> High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.

<sup>&</sup>lt;sup>‡</sup> The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.

<sup>††</sup> Reviewers document uncertainties and strengths for each metric, when deemed necessary.

Note: This metric met the criteria for medium or high confidence rating as described in Appendix F of the Application of Systematic Review for TSCA Risk Evaluations document. EPA acknowledges that there are instances where the characteristics of the study does not fully fulfill the criteria of the particular metrics. EPA plans to default to the definitions of the confidence levels and corresponding scores at the metric level (see below) when the criteria language is not currently optimized to capture a variety of study characteristics. EPA is in the process of identifying these issues to optimize the evaluation tool. (a) High: No notable deficiencies or concerns are identified in the domain metric that are likely to influence the results [score of 1]. (b) Medium: Minor uncertainties or limitations are noted in the domain metric that are unlikely to have a substantial impact on the results [score of 3]. (d) Unacceptable: Serious flaws are noted in the domain metric that consequently make the data/information source unusable. [score of 4]. (e) Not rated/applicable: Rating of this metric is not applicable to the data/information source being evaluated [no score].